MENTAL HEALTH TRENDS AMONG FEMALE YOUTH AND THE RELATIONSHIP WITH VIOLENCE

Janet Helene Ford

Submitted to the faculty of the University Graduate School

in partial fulfillment of the requirements

for the degree

Doctor of Philosophy

in the Richard M. Fairbanks School of Public Health,

Indiana University

December 2017

Accepted by the Graduate Faculty of Indiana University, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Doctoral Committee

_____.

Terrell W. Zollinger, DrPH, Co-Chair

_____.

Gregory K. Steele, DrPH, MPH, Co-Chair

_____.

Jianjun Zhang, MD, PhD

July 26, 2017

_____.

Joseph O'Neil, MD, MPH

ACKNOWLEDGEMENTS

This research was made possible by the Fairbanks School of Public Health faculty and staff, and the public availability of the YRBS dataset via the CDC. Sincere gratitude for the guidance provided by the dissertation research committee, specifically the dedication and direction provided by Dr. Zollinger, the statistical guidance of Mr. Nelson, the clinical insights of Dr. O'Neil, the scientific rigor of Dr. Zhang and the insights from Dr. Steele. Thanks to my employer and supervisors for the availability of financial support and a flexible schedule which made this endeavor feasible. This would not have been possible without the support of my family and friends, for whom I am most thankful.

Janet Helene Ford

MENTAL HEALTH TRENDS AMONG FEMALE YOUTH AND THE RELATIONSHIP WITH VIOLENCE

Objective: Investigate if the prevalence of depression/suicidality changed from 2001 to 2015 among adolescent females exposed to sexual assault or physical fighting, and if various violent exposures or the accumulation of events induced differential levels of risk.

Methods: Eight national Youth Risk Behavior Surveillance (YRBS) cross-sectional databases (2001-2015) were analyzed using complex survey techniques. For the trends analyses, logistic regression was used to evaluate linear, quadratic or cubic trends, with contrast statement methods to identify inflection points. Multiple logistic regression models were built to understand associations with other risk factors. The 2015 database was used for the differential analyses and hypotheses were tested using logistic regression models.

Results: There was a statistically significant decline in depression/suicidality from 2001 to 2009 followed by an incline through 2015 for sexual assault victims (P=0.0001) and physical fighters (P<0.0001). Bullying and electronic bullying contributed to increases in latter years. For sexual assault victims, methamphetamine use declined (2001-2015) and team sports participation increased (2009). For physical fighters, sexual assault and carrying a weapon had a similar quadratic trend. Among fighters the prevalence of other violent exposures (1+) was approximately 2 times greater than non-fighters (2001-2015) and exceeded 65% when accounting for bullying and electronic bullying (2011-2015). Differentiation of risk between various violent events was only observed for electronic bullying (OR=2.51; 95% CI=[2.02, 3.13]) vs. bullying (OR=1.43; 95% CI=[1.13, 1.79]) and victimization (OR 3.79; 95% CI=[3.33, 4.30]) vs. violence-related behaviors (OR=2.31; 95% CI=[1.81, 2.96]). There was a positive dose-response

relationship with the cumulative number of violent events, one event produced a risk of 1.40 (95% CI=[1.33, 1.48]) which increased with each additional exposure.

Conclusions: The direction of depression/suicidality prevalence changes among sexual assault victims and physical fighters may be attributable to unique modifiable risk factors. The emergence of electronic bullying contributed to increases in depression/suicidality, poly-victimization, and induced greater risk than bullying. The accumulation of violent exposures is seemingly a stronger predictor of depression/suicidality. Overall, efforts to reduce exposure across multiple or more prevalent forms of violence has the potential to reduce the risk of depression/suicidality among female adolescent victims and aggressors of violence.

Terrell W. Zollinger, DrPH, Co-Chair

Gregory K. Steele, DrPH, MPH, Co-Chair

TABLE OF CONTENTS

LIST OF TABLES

Chapter 2

Chapter 3

Chapter 4

LIST OF FIGURES

Chapter 1

Chapter 2

Chapter 3

Chapter 4

LIST OF ABBREVIATIONS

APA	American Psychiatric Association
BMI	Body Mass Index
CDC	Center for Disease Control and Prevention
CI	Confidence Interval
NCTSN	National Child Traumatic Stress Network
NIH	National Institute of Health
OR	Odds Ratio
SAS	Statistical Analysis System
WHO	World Health Organization
YRBS	Youth Risk Behavior Surveillance

CHAPTER 1

INTRODUCTION TO MENTAL HEALTH TRENDS AMONG FEMALE YOUTH AND THE RELATIONSHIP WITH VIOLENCE

Among adolescent females, the rate of suicides have more than doubled from 2001 to 2014 (Anderson, 2003; Heron, 2016). In 2015, suicidal behaviors and depression were two times more prevalent among female than male adolescents, with more than 10% of female high school students reporting at least one occurrence of attempted suicide, 20% considered suicide or planned a suicide attempt, and nearly 40% reported symptoms of depression (Kann, 2016). The greater risk of suicidal behaviors and depressed mood has been attributed to violence exposures (Deeds, 2007; Lereya, 2015; Miller, 2013). Each year 1 out of every 2 adolescents experience indirect or direct violence, and female adolescents have a disproportionately higher prevalence of specific forms of violence (Cisler, 2012; Finkelhor, 2015). The female to male ratio for dating sexual violence and forced sexual intercourse is approximately 3:1 among adolescents, with the annual probability of a suicide attempt being 5 times greater among females with a history of sexual assault versus no history (Kann, 2016; Tomasula, 2012). The consequential mental health morbidity for victims of violence increases their chances of being re-victimized and developing aggressive behaviors (Deeds, 2007; Dunn, 2012; van der Put, 2015). In the 21st century, female adolescents are at even greater risk of violent exposures due to the emergence of electronic bullying (any kind of aggression perpetrated through technology), which is two times more common among female adolescents than males, resulting in a greater risk of poly-victimization and both internalizing disorders and externalizing behaviors (Deeds, 2007; Gladden, 2013; Kann, 2016; Ybarra, 2011).

Understanding the risk of suicidality and depression among female adolescent victims and aggressors of violence is important due to evidence of increasing prevalence, greater susceptibility, and the expanding potential to be exposed to electronic bullying. Suicides

accounted for 15.6% of all deaths among females ages 15 to 19 years in 2014 (Heron, 2016). Since 2001 the suicide rate more than doubled, moving suicide from the fourth to the second leading cause of death in this population (Anderson, 2003; Heron, 2016). The increase in psychological morbidity among adolescent females is concerning given genetic evidence of greater susceptible to expression when exposed to chronic stressors, such as violence (Hankin, 2015). When considering current developments, the adoption of daily electronic communication occurring along with the manifestation of electronic bullying, is leaving adolescents vulnerable to mental health morbidity, multiple violent stressors and aggression (Deeds, 2007; Lenhart, 2012; Madden, 2013; van der Put, 2015).

The National Institutes of Health's Violence Against Women (VAW) Research Report identified and called for more research specific to adolescent female victims of violence and associated psychological health impacts and perpetrating behaviors (Herrman, 2012; NIH, 2011). The benefits of addressing these gaps in female adolescent violence and mental health research, include: facilitating identification of higher risk populations, stimulating future research, building more evidence on risk factors to inform prevention and intervention initiatives, and enabling data-driven changes to policies (NCTSN, 2016; Ranney, 2014; Sumner, 2015). Public health efforts would decrease morbidity and mortality in this population as they mature into adulthood and resulting in a reduced risk of continued psychological conditions, physical injuries and comorbidities, suicide, violent criminal behaviors, and low socioeconomic status (Amstadter, 2011; Boots, 2009; Currier, 2008; Goldman-Mellor, 2014; Goldston, 2015; Sachs-Ericsson, 2016; Waldron, 2014).

A recent review suggested that online activities among adolescent females may be a contributing risk factor for the recent increase in internalizing mental health symptoms (Bor, 2014). Epidemiological studies of suicidal behaviors and the difference of effect between various violent

exposures or cumulative exposures are scarce and inconclusive; however, the few existing studies indicate that electronic bullying, sexual abuse, emotional abuse, and the accumulation of violent events may induce greater risk (Bannink, 2014; Finkelhor, 2009; Hinduja, 2014; Miller, 2013; Zimmerman, 2016). Albeit, this research was not specific to female adolescents' exposures to multiple forms of violence, including peer-induced, and did not account for the outcome of depressed mood and/or multiple suicidal behaviors, such as ideation, planning and attempting suicide. Trends in suicidal and mental health outcomes for previous time periods have been reported; however, gender-specific results were not consistently reported and trends specific to female victims and aggressors of violence have not been addressed (Bell, 2016; Curtin, 2016; Lowry, 2014; Olfson, 2015).

Among female adolescents, the changes in prevalence over time for depressed mood/suicidal behaviors when victimized or an aggressor of violence are unknown, in addition to, the occurrence of differential effects when exposed to various violent events or when multiple exposures accumulate. The purpose of this research project is to expand the understanding of the interaction between exposure to different forms of violence, including electronic forms, and resulting internalizing disorders and externalizing behaviors of adolescent females. Specifically, this research will address these three study objectives: 1) Determine if the prevalence of depressed mood/suicidal behaviors has statistically significantly changed from 2001 to 2015 among females exposed to forced sexual intercourse within their lifetime. 2) Evaluate if differential effects exist for various violent exposures and when the number of events accumulate. 3) Determine if the prevalence of depressed mood/suicidal behaviors has statistically significantly changed from 2001 to 2015 among females who engaged in physical fighting at least one time in the previous 12 months. In addition, associations with other risk factors and relevant trends will be investigated as well as evaluating data specific to suicide attempts or physical fighting injuries that require medical treatment by a health care professional.

CONCEPTUAL FRAMEWORK

The conceptual framework for mental health trends and the relationship with violence is depicted in Figure 1.1. At the individual level, from the point of violent victimization through the final outcome, several personal and environmental factors influence the recovery process. When exposed to violence in multiple settings, including at school, home and within the surrounding community, a chronic state of distress may occur (Wilkins, 2014). Longitudinal evidence supports that chronic stressors and violent exposures are associated with psychological adverse outcomes, including depression and acts of suicide (Currier, 2008; Deeds, 2007; Lereya, 2015; Miller, 2013). In addition, supporting evidence indicates that female gender and specific genetic profiles may induce greater susceptibility to internalizing mental health conditions (Currier, 2008; Hankin, 2015). When considering adolescent behaviors, alcohol or other substance use, aggression and risky sexual behaviors are known to be associated with depressed mood and suicidality; however these are also known to be associated with exposures to violence and may be used as a means to cope (Grabbe, 2016; Gorka, 2017; Herrman, 2012; Weierstall, 2013). Protective factors for depression and suicidal thoughts also exist, such as adequate social support, self-esteem and physical activity (Babiss, 2009; Giletta, 2016).

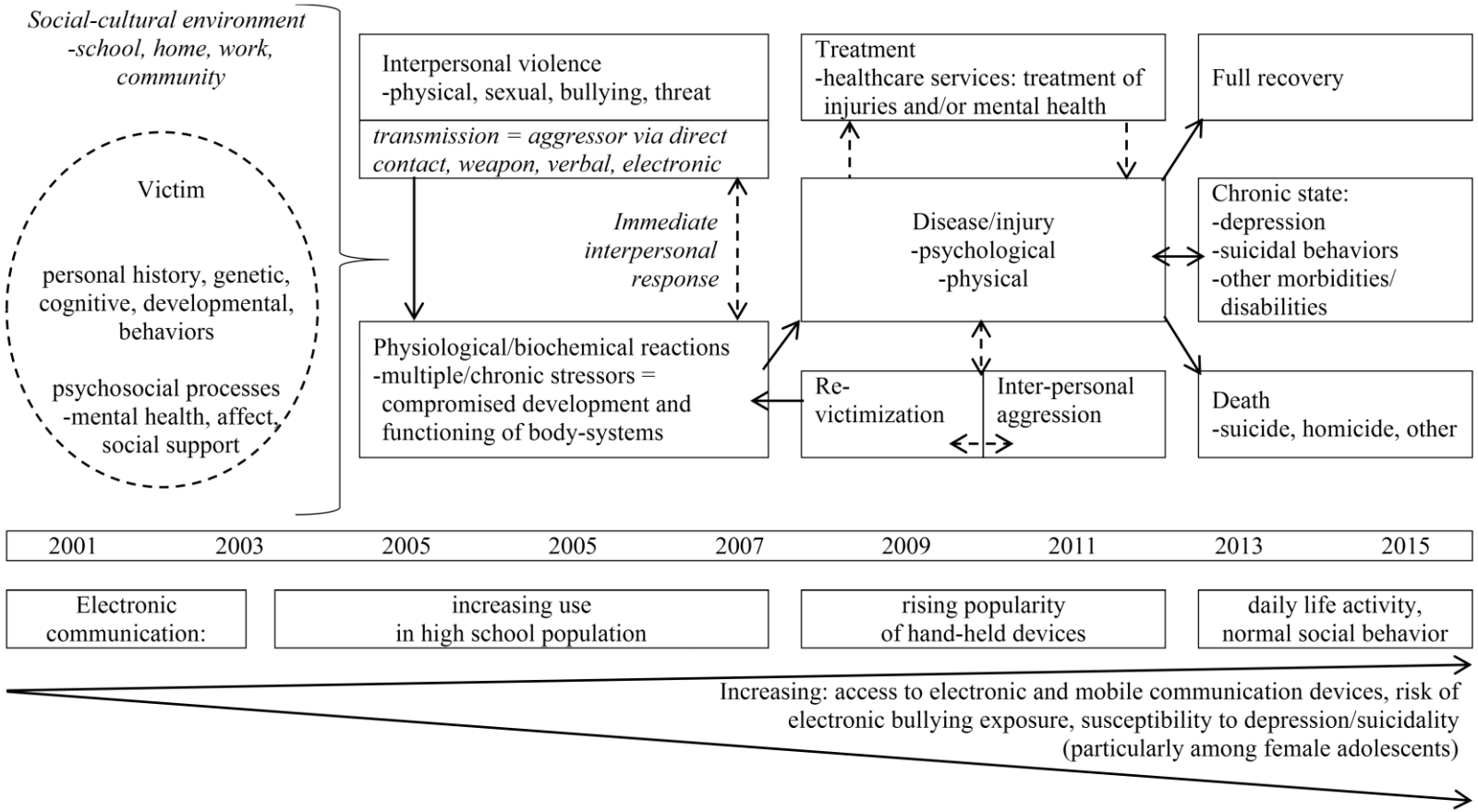
Another consideration is that interpersonal violence comes in many forms, given the definition that both the World Health Organization and CDC recognize encompasses "the intentional use of physical force or power, threatened or actual, against another person or against a group or community that results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation" (CDC, 2016; Dahlberg, 2002). Therefore, the attributes of the violent exposure is an important variable to consider when measuring the risk for depression and suicidality (Bannink, 2014; Finkelhor, 2009; Hinduja, 2014; Miller, 2013).

Adolescents may seek treatment for acute physical injuries resulting from being victimized, behaving aggressively, or a failed suicide attempt; thus, emergency department staff may have the opportunity to address both the physical and mental health needs of this population (Bridge, 2014; Cunningham, 2014; Turecki, 2016). Mental health services may also be sought independent of sustaining a physical injury, which has the potential to reduce the risk for re-victimization, progression to aggressive behaviors, other morbidities and premature death (Goldman-Mellor, 2014; Goldston, 2015). Therefore, access to evidence-based mental health services and the integration of trauma-informed practices throughout the community has the potential to reduce depression and suicidal behaviors among adolescent females exposed to violence (NCTSN, 2016).

Adolescent communication patterns have experienced a significant change from 2001 through 2015, given the normalization of the use of electronic means and mobile devices (Lenhart, 2012; Madden, 2013). This change has resulted in the introduction of a new form of violence: electronic bullying (Gladden, 2013; Ybarra, 2011). This addition provides more opportunities for exposure to different violent acts and greater risk of experiencing multiple forms of violence. Since adolescents' body-systems are still developing, an environment of multiple violent stressors has the potential to impair maturation and increase the risk of depression and suicidal behaviors (Arain, 2013; Currier, 2008; Sachs-Ericsson, 2016). Also, both victimization and the subsequent psychological effects leave adolescents at greater risk of re-victimization, with poly-victimization inducing the risk of evolvement to aggressive behaviors (Deeds, 2007; Lenhart, 2012; Madden, 2013; van der Put, 2015). Overall, the addition of electronic bullying may be resulting in an increasing risk of poly-victimization, aggressive behaviors and associated morbidity and mortality (Bell, 2016; Boots, 2009; Goldman-Mellor, 2014; Goldston, 2015). Therefore, the conceptual model for this research emphasizes the need to address trends in depressed mood and/or suicidal behaviors as related to violent victimization and aggression, risks associated with

exposure frequency and type, the role of other risk and protective factors, and the implications of sustaining an injury in need of treatment for a suicide attempt or an aggressive behavior.

FIGURE 1.1 Conceptual Framework for Adolescent Mental Health Trends and the Relationship with Violence



CHAPTER 2

TRENDS IN DEPRESSED MOOD AND SUICIDAL BEHAVIORS AMONG HIGH SCHOOL-AGED FEMALE VICTIMS OF FORCED SEXUAL INTERCOURSE

Exposure to sexual assault within an adolescent female's lifetime induces a five times greater annual risk of a suicide attempt compared to those without such a history (Tomasula, 2012). Even when controlling for other violent exposures, adolescent female victims of forced sexual intercourse remain at greater risk of depressive symptoms and suicidal thoughts (Dunn, 2012; Kindrick, 2013). Exposure early in life is common, with four out of ten adult females reporting a history of forced sexual intercourse prior to the age of 18 years (Breiding, 2014). When early-life sexual victimization occurs, females are more susceptible to future re-victimization associated with sexual violence. In addition as these women progress into adulthood they are at greater risk of physical and mental health morbidity (Amstadter, 2011; Waldron, 2014).

Suicide was the second leading cause of death among females ages 15 to 19 years in 2014 accounting for 15.6% of all deaths, a rate that has more than doubled from 2001 when suicide was ranked as the fourth leading cause death in this population (Anderson, 2003; Heron, 2016). There has also been an increase in both inpatient and outpatient mental health care utilization among adolescents in the U.S.; yet, less than 50% with severe mental health impairment receive outpatient treatment (Olfson, 2015; Torio, 2015). When considering female victims of sexual violence, less than one-half reported contact with mental health services; albeit, this population's utilization of mental health services, independent of self-harming behaviors, is higher than those exposed to other forms of violence (Green, 2014). Availability of onsite and follow-up mental health services also becomes a concern when victims of forced sexual intercourse seek initial care in emergency department settings, with approximately one out of four attending the initial referral appointments and less than one out of ten complying with subsequent counseling sessions (Darnell, 2015; Patel, 2013).

One avenue for forced sexual intercourse disclosure and seeking help for mental health sequela is via online communication, social media and services; particularly given the recent emergence of computer and mobile technology use among adolescents (Best, 2014; Madden, 2013; Rickwood, 2015). However online environments produce mixed effects on adolescents' mental health; given the potential to access online social-support and health related services versus susceptibility to aggression perpetrated through technology (electronic bullying) (Best. 2014; Gladden, 2013; Lenhart, 2012). The latter would be concerning for victims of forced sexual intercourse, given that sexual assault, including forced sexual intercourse, is a specific violence exposure with greater risk of online victimization and further exacerbation of trauma-related symptoms among youth (Mitchell, 2011). Also, a recent review found mental health problems among children and adolescents have been increasing in the 21st century along with an increasing number of adolescent females suffering from internalizing symptoms, suggesting that online activities may be one of the contributing factors (Bor, 2014). With the high risk for depression and suicidal behaviors in this population and the increasing adoption of technology that may serve to decrease or exacerbate sequela, there is a need to better understand the prevalence time trends of these symptoms among young female victims of sexual assault.

This research question is of importance given the increase in suicide rates for this demographic, continued access barriers to mental health services, the normalization of internet use and electronic means of communication, which may serve to help or harm this vulnerable population, and the need to better understand underlying risk factors related to depressed mood and/or suicidal behaviors during this time period. This study investigated changes in the prevalence of depressed mood and/or suicidal behaviors among female high school students exposed to forced sexual intercourse from 2001 through 2015 in the U.S. The primary research hypothesis is that the prevalence of depressed mood and/or suicidal behaviors among female adolescents exposed to

forced sexual intercourse has increased during this time period, due to the introduction of electronic bullying resulting in greater risk of the outcome in an already vulnerable population. Also, suicide attempts resulting in injury, poisoning, or overdoses that required treatment by a healthcare professional were expected to follow a similar trend line as the primary outcome.

Inclusion criteria for this study included high school students (i.e. grades nine through twelve) in public and private schools who identified themselves as female for the survey years of 2001 through 2015 in the Youth Risk Behavior Surveillance (YRBS) national U.S. survey. Of the 117,815 survey participants, 59,091 self-identified as females and 415 had missing responses for gender. The weighted sample was nationally representative, consisting of 49.2% female high school students.

This research study involved a secondary data analysis of the national combined dataset of the YRBS cross-sectional surveys of high school students from 2001 through 2015. The YRBS began in 1991 and is administered every two years by the Center for Disease Control and Prevention (Brener, 2013). The purpose of the survey is to monitor adolescent health risk behaviors associated with social well-being, morbidity, and mortality (Brener, 2013). Unintentional injuries, violence, sexual behaviors, alcohol and other drug use, tobacco use, unhealthy dietary behaviors, and inadequate physical activity are the risk behavior categories captured. Revisions have occurred over time, however with only minor changes (Brener, 2013). The survey methods and data management practices used by the CDC are designed to reduce non-response bias and omit illogical surveys; with collection methods that reduce reporting bias (Krumpal, 2013). Additional information on the YRBS methods are available on the CDC website (CDC, 2016a). This database was chosen due to the national representativeness of the target population, the ability to conduct a trends analysis, the large sample sizes, and the availability of responses to survey items needed to answer the research questions.

The outcome variable used responses to survey items related to depression, suicidal thoughts and behaviors. Participants were identified has having depressive mood/suicidal behaviors when they responded positively to one or more of the following: a) "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?" b) "During the past 12 months, did you ever seriously consider attempting suicide?" c) "During the past 12 months, did you make a plan about how you would attempt suicide?" d) "During the past 12 months, how many times did you actually attempt suicide?" (CDC, 2016b). This definition encompassed both reported signs and symptoms of depression and suicidal behaviors and was analyzed as a binary categorical variable. Exposure was defined as a positive response to the following question: "Have you ever been physically forced to have sexual intercourse when you did not want to?" (CDC, 2016b).

The statistical models included as covariates exposure to other major violent events consistently captured across the years including: carrying a weapon, feeling unsafe at or on the way to/from school, threatened and/or injured with a weapon, and physical fighting. These exposure variables were analyzed as binary categorical responses.

Race/ethnicity and school grade were controlled for in each of the analyses and a *p*-value (*p*) <0.05 was required for statistical significance. For the trends analysis, the methods used ensured that linear and non-linear trends were assessed. The first step entailed conducting logistic regression analyses to test for linear, quadratic or cubic trends (CDC, 2016c). When a nonlinear trend was detected, odds ratios within the study period were compared to the average of the other survey years for significant differences (i.e. contrast statement) to identify possible inflection points. Line segments were then tested for linearity before and after points of inflection to determine if trends were increasing or decreasing. Recommended SAS options for conducting a

trends analysis using complex survey data were applied to ensure comparability with SUDAAN (Chen, 2006).

After conducting the time-series analysis, multivariable logistic regression models were built to evaluate the inclusion of additional covariates, while controlling for the statistically significant survey year trend type (i.e. linear, quadratic or cubic). Both stepwise and purposeful selection techniques were used to evaluate covariates for inclusion in the models. Modified purposeful selection techniques were used to build final multivariate models (Hosmer 1999 & 2005). Race, grade and the exposure to forced sexual intercourse were retained in every model, the first step in variable reduction was to remove those within each risk behavior category that were not statistically significant in the model. A significance level of $p<0.05$ was required for retention. Clinical judgment was used throughout the model building process. Body mass index (BMI) was included in the model as a continuous variable and then converted to binary in the final model for interpretability. The BMI percentile ranges for underweight, overweight, and obese in an adolescents population were evaluated as meaningful cut-offs (CDC, 2017). The binary variable criteria for "yes" was defined as a BMI less than the 5^{th} percentile (underweight) or a BMI equal to or greater than the 95^{th} percentile (obese) relative to the YRBS female population from 2001 to 2015. In addition, interactions with the exposure of interest, other violent behaviors, and participation in team sports were tested by adding multiplicative terms in the final model, a $p<0.05$ was required to be considered significant. A sensitivity analysis was conducted with the outcome of suicidal attempts requiring medical treatment among those ever exposed to forced sexual intercourse in their lifetime, to assess significant changes over the time period using the same trend analysis methods.

The CDC used a three-stage cluster sample design for the YRBS in order to obtain a nationally representative sample of high school students (CDC, 2016a). As a result, all analyses used sample

weights provided by the CDC, accounting for the sampling units, strata, and weights. Sampling was generally performed at the county level. Urban/rural and minority composition were accounted for with the strata and weights accounted for oversampling of black and Hispanic students, school/student nonresponse, student sex, race/ethnicity, and grade. SAS® (SAS Institute Inc., Cary, NC) version 9.4 SURVEY procedures were used to conduct the study analysis. This study was granted protocol exempt status by the Indiana University Institutional Review Board on August 18, 2016.

Among the 57,708 female students in the weighted sample from 2001 through 2015, the majority were white (59.2%), followed by Hispanics (18.0%), blacks (14.3%), and other races (8.5%) as shown in Table 2.1. The distribution by grade was highest for ninth graders (28.1%), and lowest for twelfth grade (22.3%). Among the total female student population the prevalence of depressed mood and/or suicidal behaviors over the study period was 43.9% in 2001, to a low of 39.8% in 2009, and a high of 45.1% in 2015.

The trends analysis for the prevalence of depressed mood and/or suicidal behaviors among females with a history of forced sexual intercourse did not have a statistically significant linear (p=0.688) or cubic trend (p=0.086) from 2001 through 2015 (Figure 2.1). However, there was a significant quadratic trend (p<0.001) with an inflection point in 2009. The prevalence of the outcome among those reporting a history of forced sexual intercourse (exposed) was 64.9% in 2009 versus 77.1% in 2001 and 74.6% in 2015, compared to 36.9% in 2009 versus 40.0% in 2001 and 42.0% in 2015 among those without such a history (non-exposed). Among the exposed, in 2001 and 2015 approximately 3 out of 10 attempted suicide in the past 12 months. Among those not exposed, in 2001 and 2015 less than 1 out of 10 attempted suicide. For the sensitivity analysis, there was not a significant linear (p=0.310) or cubic (p=0.787) trend from 2001 to 2015 for suicide attempts requiring professional medical treatment among female students with a

history of forced sexual intercourse. However, there was a significant quadratic trend ($p<0.001$) with an inflection point in 2007. More than 1 out of 10 in the exposed group needed treatment in 2001 and 2015 versus approximately 0.2 out of 10 in the unexposed group.

The final model resulted in females with a history of forced sexual intercourse having a 2.31 (95% CI=[2.11, 2.53]) greater risk of developing depressed mood and/or suicidal behaviors than those without a history, even when controlling for other risk factors (Table 2.2). There was a statistically significant interaction with a history of forced sexual intercourse and physical fighting ($p<0.010$), such that the exposed group experienced a reduced level of risk of the outcome when they participated in physical fighting. There was not a statistically significant interaction with participation in team sports or other violent risk factors ($p>0.05$). Grade and race were both significant at $p<0.001$. When compared to 9th grade, those in 12th grade had a significantly lower risk (OR=0.78; 95% CI=[0.72, 0.84]). When compared to whites, Hispanics and other races had significantly higher risk, OR=1.33 (95% CI=[1.25, 1.43]) and OR=1.37 (95% CI=[1.22, 1.53]), respectively. Table 2.2 also shows the results of analyzing the model for years 2011 through 2015 when both bullying at school and electronic bullying were captured by the YRBS. Having a history of forced sexual intercourse remained significant, with an odds of 2.18 (95% CI=[1.86, 2.55]). All other risk factors remained statistically significant with the exception of methamphetamine use ($p=0.095$) and being underweight or obese ($p=0.535$). Both physical bullying and electronic bullying were statistically significant risk factors for depressed mood and/or suicidal behaviors, with an odds ratio of 1.82 (95% CI=[1.62, 2.04]) and 2.29 (95% CI=[2.01, 2.60]), respectively.

Considering the significant trend in depressed mood and/or suicidal behaviors among females exposed to forced sexual intercourse, the prevalence trends of the final model predictor variables within this population were evaluated. Those that decreased at least 5% between 2001 and 2009

are presented in Figure 2.2. Between 2001 and 2009 the largest decline in the exposure group was methamphetamine use, from 35.7% to 16.4%, and among those who were unexposed, cigarette smoking had the greatest decline, from 34.7% to 24.7%.

Figure 2.3 displays the prevalence of the risk behaviors that increased at least 5% any year from 2009 through 2015 as well as the emerging risk behavior of electronic bullying. The one risk behavior among those exposed with the outcome that followed a similar pattern as the primary trend analysis (Figure 2.1) was participation in team sports (Figure 2.3). An increase in participation in team sports from 39.3% to 51.7% was observed in the exposure group with the outcome when comparing 2001 to 2009, followed by a drop in participation ranging from 42.7% to 45.8%; however, this pattern was not observed in the unexposed group. An increase in absences from school due to feeling unsafe was observed from 2009 to 2013, from 16.6% to 22.4% in the exposed and 8.1% to 12.2% in the unexposed groups, respectively. Among the exposed group bullying increased from 43.5% to 54.8% between 2009 and 2015 and 29.7% to 33.2% in the unexposed. In regard to electronic bullying, from 2011 through 2015 the prevalence ranged from 46.7% to 49.6% in the exposed group, and 29.2% to 32.8% in the unexposed group.

This study identified a quadratic trend from 2001 through 2015 in the prevalence of depressed mood and/or suicidal behaviors among female high school students exposed to physically forced sexual intercourse in their lifetime, further investigation of the associated risk behaviors revealed the following: 1) exposure to forced sexual intercourse is an important risk factor across the time period, even when controlling for other variables associated with the outcome, 2) the decline in the outcome in 2009 among the exposed appears to have been driven by the decrease in methamphetamine use and the increase in participation in team sports, and 3) the subsequent increase in depressed mood and/or suicidal behavior may be attributable to the increase in the

prevalence of bullying and the emergence of electronic bullying among females exposed to forced sexual intercourse with the outcome.

To our knowledge, a trends analysis study focused on internalizing mental health symptoms for this specific population and proximal to this time period has not been reported in the literature. However, there was a YRBS trends analysis of all students from 1991 through 2011 where the results for females indicated decreasing linear trends for making a suicide plan and attempts as well as a quadratic trend for considering suicide with an inflection point in 2009 (Lowry, 2014). Also, national death statistics indicate an increase in suicide deaths among females 15-19 years with a steady increase from 2001 through 2014 of 7.0% to 15.6% (Anderson, 2003; Heron, 2016). In this study, the different trend for suicide attempts requiring treatment by a health care professional in the exposure group may be attributable to different risk factors that impact the degree of injury when unsuccessful suicide attempts occur. Overall, this research provides new information about the risk of depressed mood and/or suicidal behaviors among adolescent females with a history of forced sexual intercourse during a period of time period when a new vehicle for bullying was introduced, while also addressing important patterns in risk behaviors and potential confounders.

Prior violent exposures, such as forced sexual intercourse, are known risk factors for mental health morbidity and the adoption of high-risk behaviors such as drinking alcohol, cigarette smoking, illegal drug use and activity, and aggressive violent behaviors, which are also associated with the outcome, (Amstadter, 2009; Herrman, 2012; King, 2008; Lowry, 2014). For female adolescents with depressed mood and/or suicidal behaviors, high risk behaviors were more prevalent among those exposed to forced sexual intercourse than those not exposed; however, substance abuse behaviors may be serving as a manner to cope with the trauma. Documented reasons for substance use among female victims of sexual violence include escaping from

negative emotions, providing a sense of social connection with other users, and relief from mental health symptoms; albeit with the psychological benefits diminishing over time (Agrawal, 2013; Foster, 2016; Gorka, 2017; Grabbe, 2016). In addition, aggressive behaviors have been found to relieve symptoms and reduce the risk of suicidal ideation among victims of violence (Weierstall, 2013). Similar to Weierstall's findings (2013), our research indicated that when the exposure group participated in physical fighting the level of risk of the outcome was lowered. Body-image and weight-related variables have also been found in prior literature to be associated with sexual assault, and weight loss or gain is a symptom of depression (APA, 2013; Groff, 2016; Palmisano, 2016).Hence, many of the risk factors identified in this study are confounders that are associated with both the exposure and the outcome. In addition, some of the risk behaviors may serve to reduce the level of risk in the exposed population; however, the cumulative reduction most likely also contributed to the decline in the outcome.

Those in the exposure group also reported higher use of methamphetamine, which has been shown to induce the second highest amount of risk for suicidal thoughts and behaviors behind heroin. Adolescent users are known to have a risk that is four times higher than non-users (Wong, 2013). Also, consistent with our findings, the Center for Behavioral Health Statistics and Quality (2015) report indicates a decline in reported lifetime use of methamphetamine among females ages 12 to 17 years from 2002 through 2014. The large percentage decrease of approximately 75% in methamphetamine use from 2001 to 2015 in the exposed population suggests the possibility that other risk factors were contributing to the risk of the outcome in the latter years of the study period.

In regard to the protective factor of playing on at least one team sport, the exposure group was less likely to participate than the unexposed group (with the exception of 2009); however, the effect of team sports in this population seen in the present study is consistent with other research

that has identified that the physical and social aspects of this activity contribute to the mental health benefits among adolescents (Hallal, 2015; Riese, 2015). Another interesting trend in the risk behaviors was the increase in being absent from school due to feeling unsafe at school or when travelling to/from school from 2001 through 2013; which was also more common in the exposed group. Literature has reported a biological link with sexual assault and heightened neurological activation of fear response (Cisler, 2013). Also, this variable may be indicative of avoidance of trauma-associated stimuli; potentially capturing symptoms of post-traumatic stress disorder (PTSD) for those who have been victimized (APA, 2013). Research has found that PTSD symptoms from sexual trauma are associated with suicidal behaviors, even when controlling for depression symptoms and a history of prior suicide attempts (Brabant, 2014). Given the trends in this study, potential initiatives within the school environment may include increasing participation in team sports and addressing means to increase safety, particularly for female victims of sexual violence.

This research indicates that the increase in bullying and the introduction of electronic bullying has most likely played an important role in increasing the risk of depressed mood and/or suicidal behaviors among adolescent females exposed to forced sexual intercourse. Since 2006, 95% of teens have had access to the internet; however in 2015 nearly three out of four adolescent females had access to a smart phone (Lenhart, 2015). Due to the increase in mobile device use 92% of adolescents now go online daily, with females dominating the use text messaging and social media (Lenhart, 2015; Madden, 2013). Increasing opportunities for electronic bullying to occur throughout the day are concerning, particularly given that female youth exposed to forced sexual intercourse are more vulnerable to online victimization and mental health sequela (Mitchell, 2011). Based on our research, an increase in the prevalence of bullying among the exposed population with the outcome has occurred in recent years, elevating the need for additional research to better understand the implications of the addition of a new form of bullying (Bannink,

2014; Hinduja, 2014). Overall the trends observed in this study may have been related to the convergence of a number of factors, including changes in multiple risk behaviors that were related to the initial decline, which was followed by an increase given the introduction of electronic bullying and the concurrent rise in bullying. The year 2009 was the intersection of these changes, however other unmeasured factors, such as economic circumstances, may have contributed to the observed trend in suicidal outcomes among females exposed to forced sexual intercourse.

The strengths of this study include using a national representative sample with results that are generalizable to female high school students in the U.S. This was a study design that identified trends in the outcome over time using established methods, while also evaluating other exposures and related variables. The survey questions and the collection methods used by the YRBS reduced reporting bias, including giving respondents the assurance of anonymity, avoiding skip patterns, and other measures to ensure privacy, which improved the validity of responses to sensitive questions (Brener, 2013; Krumpal, 2013). A model was built to ensure control for other risk behaviors associated with the outcome during the study period.

The limitations for this study include not being able to establish cause and effect, due to the use of cross-sectional data and the lack of information on the sequence of events. However, some sense of the time sequence is present as measures of the outcome were current and previous exposure were reported. The manner in which high school students interpret and respond to the survey may have changed over time introducing systematic error; particularly given that this is a self-reported measure completed by high school students with the potential for changing openness about reporting behaviors and experiences. Among adolescents who are not enrolled in school, engagement in risky behaviors is more common and the potential for different trends among non-school attendees during this time period is possible (Brener, 2013). The results are representative

of high school students only at the national level and cannot be extrapolated to smaller geographies. The lack of consistent collection of other violent behaviors, such as sexual and physical dating violence, during this time period limits the ability to control for other confounding variables. Also, the YRBS does not measure other variables related to mental health history or access to treatment, family-related risk factors, socioeconomic, or school environments, which likely changed during this time period (CDC, 2016a).

This study provides important epidemiologic evidence that changes in the prevalence of depressed mood and/or suicidal behaviors among female adolescents exposed to forced sexual intercourse have occurred from 2001 through 2015. The trends were most likely attributable to changes in unique modifiable risks which included a decline in methamphetamine use, an increase in team sport participation, and the cumulative decrease in other specific risk factors (2001-2009). This time period was followed by an increase in bullying and the notable emergence of electronic bullying (2009-2015). The results of the trends analyses can help inform public health initiatives that address the mental health of female adolescents, emphasizing the need to monitor both outcomes and risk behaviors over time. While also identifying newly emerging risks, which will enable shifts in interventions and prevention measures to better meet the needs of susceptible populations. With the reprehension surrounding sexual assault and the potential for nondisclosure; schools and communities may not identify these forms of violence as an area of concern; however, this is a vulnerable population with a markedly high prevalence of psychological morbidity that is in need of mental health services (Abrahams, 2013; Herrman, 2012). Further research is needed to determine the best means for reaching this population, how to remain current and holistically address risky behaviors, and how to sustain means for reducing the risk of depressed mood and suicidal behaviors among adolescent females that have been sexually victimized. Prior to exploring this, there is a need to address depressed mood and/or suicidal behaviors as related to risks associated with violent exposure frequency and type, the role

of other risk and protective factors, and the implications of sustaining an injury in need of treatment for a suicide attempt.

TABLE 2.1 Prevalence of Depressed Mood and/or Suicidal Behaviors and Forced Sexual Intercourse (YRBS Females, 2001-2015)

Demographics	n	%
Race/Ethnicity		
White	33778	59.2
Black	8130	14.3
Hispanic	10252	18.0
Other	4829	8.5
Grade		
9th	16167	28.1
10th	14878	25.9
11th	13641	23.7
12th	12835	22.3
Total Females	57708	100.0

Prevalence of Outcome and Exposure	Depressed /Suicidality		Forced Sexual Intercourse	
Year	n	%	n	%
2001	3054	43.9	687	10.3
2003	3315	45.0	817	11.9
2005	2977	43.4	719	10.8
2007	2884	41.5	770	11.3
2009	3113	39.8	792	10.5
2011	3074	41.3	857	11.8
2013	3005	44.3	705	10.5
2015	3404	45.1	734	10.3
Total	24826	43.0	6082	10.9

Note: Depressed/suicidality accounts for at least one positive response to having a depressed mood, considering, planning or attempting suicide in the past 12 months. Forced sexual intercourse is physically forced, and an exposure within lifetime. Weighted values are reported.

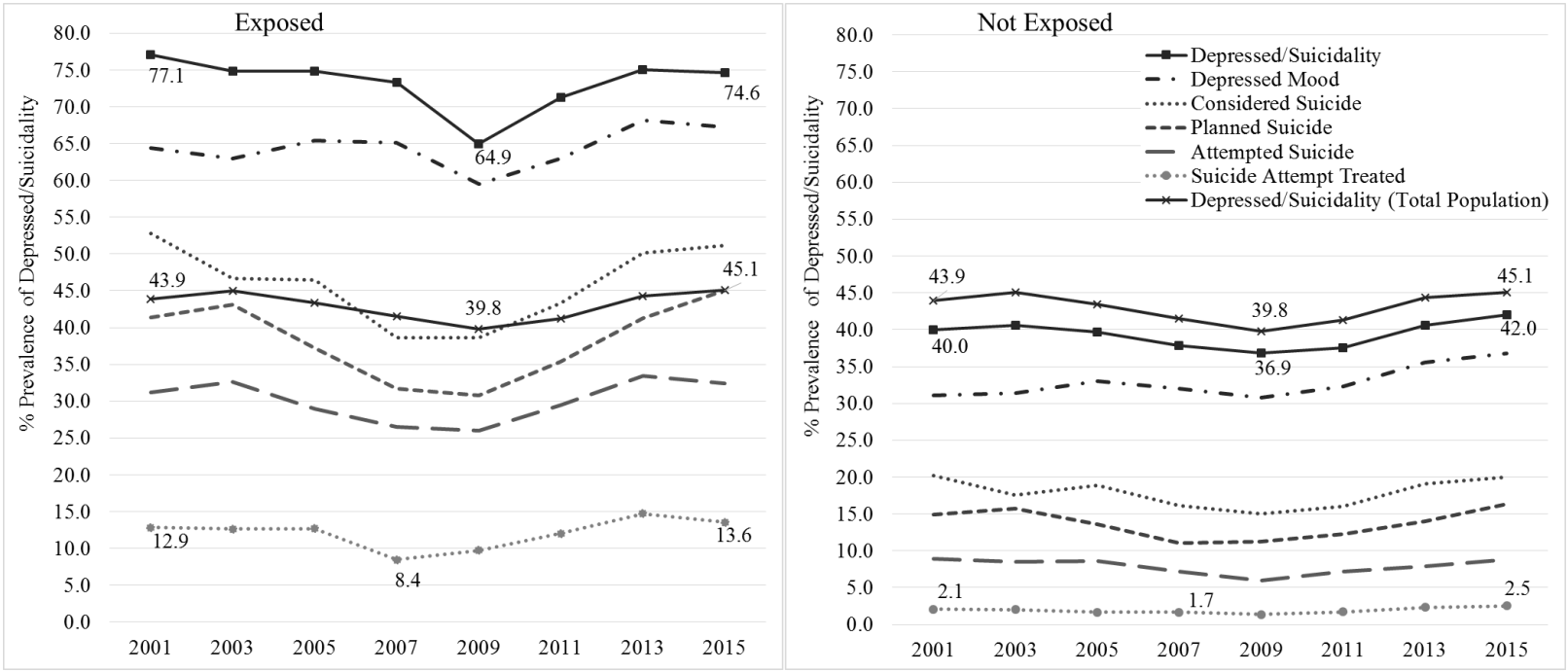


FIGURE 2.1 Trends Analysis: Depressed Mood and/or Suicidal Behaviors among Females Exposed to Forced Sexual Intercourse (YRBS, 2001-2015)

Depressed mood and/or suicidal behaviors: significant quadratic trend, 2009 and 2011 are significantly different than the average for the other years, $p<0.001$ and 0.009 respectively; and 2001 ($p<0.001$), 2003 ($p=0.020$) and 2005 ($p=0.003$) are significantly different than 2009. 2013 ($p=0.001$) and 2015 ($p<0.001$) are significantly different than 2009, and sign different than 2011, $p=0.011$ and 0.008 respectively.
Treated suicide attempt: significant quadratic trend, 2007, 2009, 2013 and 2015 are significantly different than the average for the other years, $p=0.030$, 0.006, 0.030 and 0.020 respectively. 2007 is significantly different than 2001, $p=0.037$. 2013 and 2015 are significantly different than 2007, $p=0.003$ and 0.003; and 2009 (both $p<0.001$).

TABLE 2.2 Final Model: Risk Behaviors Associated with Depressed Mood and/or Suicidal Behaviors (YRBS Females, 2001-2015)

Variables		Model: 2001-2015*		Model: 2011-2015^	
		OR	95% CI	OR	(95% CI)
Felt unsafe at school, or travelling to/from (≥1abscence, last 30 days)		2.47	[2.12, 2.88]	2.36	[1.85, 3.02]
Forced sexual intercourse (lifetime)		2.31	[2.11, 2.53]	2.18	[1.86, 2.55]
Inhalant use (lifetime)		2.03	[1.84, 2.25]	1.63	[1.35, 1.96]
Threatened/injured with weapon at school		1.83	[1.56, 2.13]	1.33	[1.02, 1.75]
Physical fighting +		1.60	[1.49, 1.72]	1.53	[1.34, 1.76]
Illegal drugs at school		1.54	[1.44, 1.66]	1.42	[1.26, 1.60]
Carried a weapon (≥1 day, 30 days)		1.48	[1.32, 1.66]	1.62	[1.34, 1.97]
Trying to lose weight		1.35	[1.27, 1.44]	1.30	[1.17, 1.44]
Current cigarette use (≥1 time, last 30 days)		1.34	[1.23, 1.47]	1.34	[1.12, 1.59]
Current alcohol use (≥1 drink, last 30 days)		1.34	[1.26, 1.42]	1.48	[1.33, 1.65]
Initiation of alcohol use (<13 years of age)		1.33	[1.23, 1.43]	1.31	[1.13, 1.51]
Self-identify as overweight		1.28	[1.20, 1.36]	1.23	[1.11, 1.35]
Methamphetamines use (lifetime)		1.27	[1.07, 1.49]	1.44	[0.94, 2.21]
Sexually active (≥1 partner, last 3 months)		1.24	[1.16, 1.32]	1.21	[1.08, 1.34]
Underweight or obese		1.10	[1.02, 1.18]	0.96	[0.83, 1.10]
Sports team participation (≥1 team)		0.79	[0.75, 0.84]	0.73	[0.66, 0.81]
Bullied at school				1.82	[1.62, 2.04]
Electronically bullied				2.29	[2.01, 2.60]
Grade: 9th grade as reference group,	10th grade	0.98	[0.91, 1.06]	0.94	[0.83, 1.08]
	11th grade	0.96	[0.88, 1.04]	0.97	[0.86, 1.10]
	12th grade	0.78	[0.72, 0.84]	0.79	[0.69, 0.91]
Race/ethnicity: white as reference group,	black	1.06	[0.97, 1.15]	1.32	[1.14, 1.53]
	Hispanic	1.33	[1.25, 1.43]	1.59	[1.42, 1.79]
	other races	1.37	[1.22, 1.53]	1.45	[1.24, 1.70]

YRBS began collecting data on being bullied in 2009 and the electronic form in 2011. Models controlled for race, grade and quadratic trend for survey year. If not specified, timeframe is the last 12 months. *2001-2015: All *ps* <0.05, except 10th grade (*p*=0.644), 11th grade (*p*= 0.281) and black race/ethnicity (*p*=0.213). + 2001-2015: Significant negative interaction with forced sex (*p*=0.003). ^2011-2015: All *ps* < 0.05, except methamphetamine use (*p*=0.095), Underweight or obese (*p*=0.535), and 10th grade (*p*=0.388) and 11th grade (*p*=0.673).

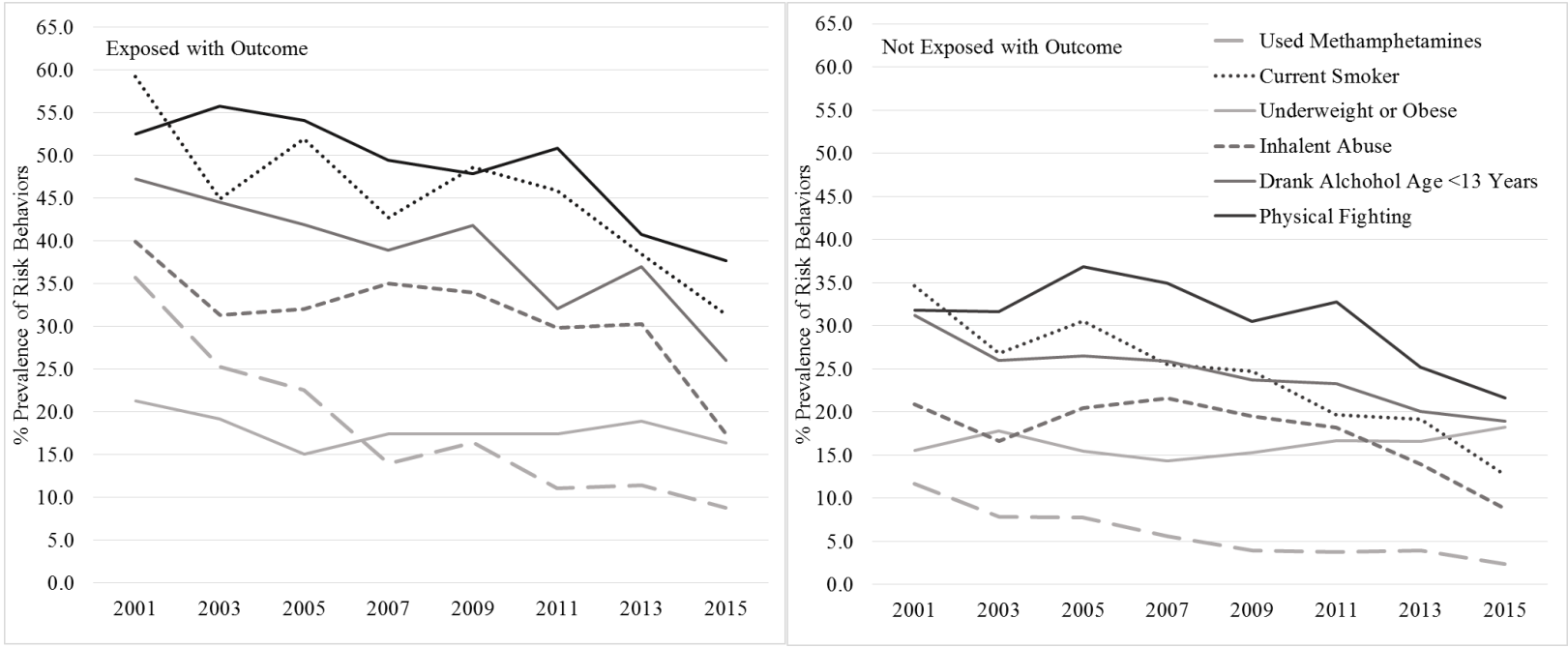


FIGURE 2.2 Prevalence of Decreasing Risk Behaviors among Females with Depressed Mood and/or Suicidal Behaviors by Forced Sexual Intercourse Exposure Status (YRBS 2001-2015)

Note: Risk factors from Table 2.2 Final Model that decreased at least 5% from 2001 to 2009.

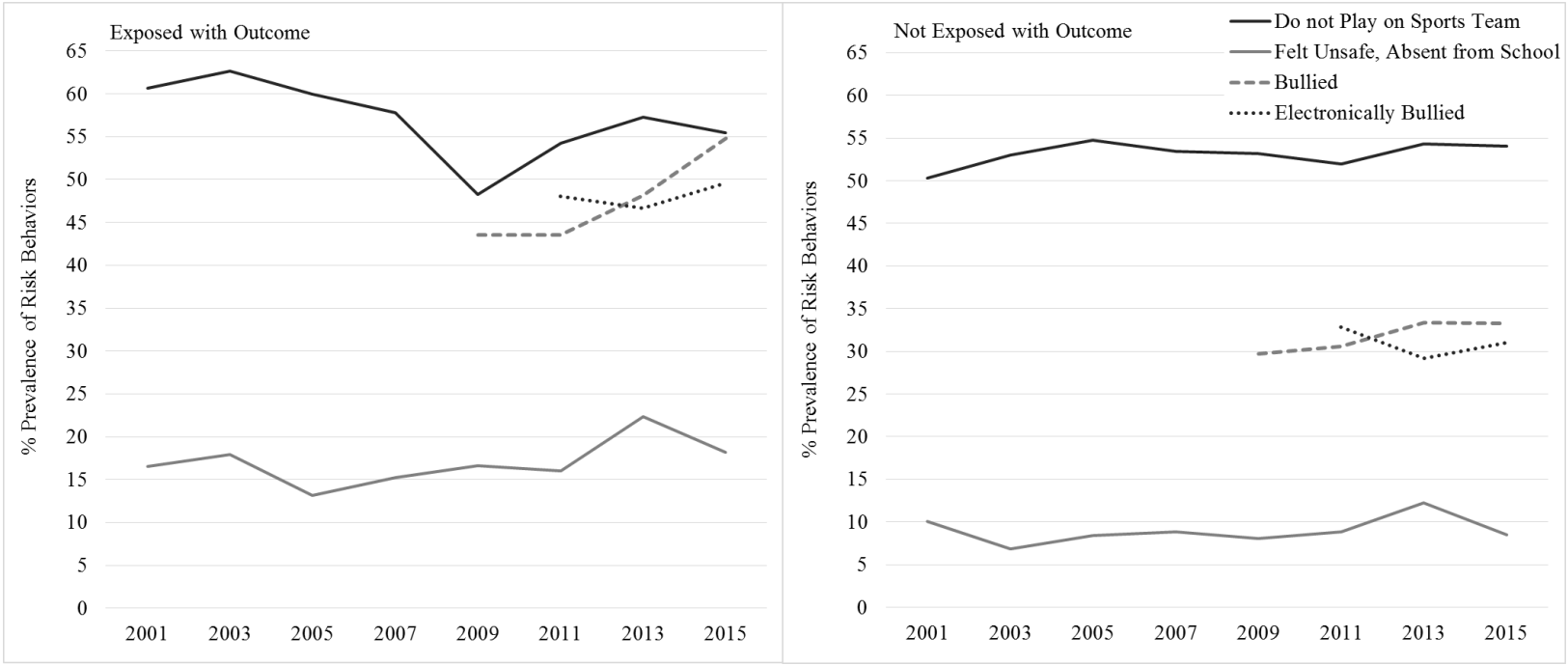


FIGURE 2.3 Prevalence of Increasing and Emerging Risk Behaviors among Females with Depressed Mood and/or Suicidal Behaviors by Forced Sexual Intercourse Exposure Status (YRBS, 2001-2015)

Note: Risk factors from Table 2.2 Final Model, that increased at least 5% any year from 2009 through 2015, and emerging risk of electronic bullying. YRBS began collecting data on being bullied in 2009 and the electronic form in 2011.

CHAPTER 3

DIFFERENTIAL EFFECTS OF VIOLENCE ON DEPRESSION AND SUICIDAL BEHAVIORS AMONG FEMALE ADOLESCENTS

Exposure to any form of violence increases the risk of depression and suicidal behaviors, yet each year more than 50% of adolescents experience indirect or direct violence, with specific forms being disproportionately higher among female adolescents who are at greater risk of poor mental health outcomes (Cisler, 2012; Finkelhor, 2015). The 2015 National Youth Risk Behavior Surveillance (YRBS) report provides additional data on the disparity of violent exposures between females and males (Kann, 2016). At least two out of ten female high school students report being exposed to bullying or electronic bullying, which is two times greater than males. Dating sexual violence and forced sexual intercourse among female youth is also more common, with a prevalence that is approximately three times higher than males. Studies show that this inequity continues into adulthood, with the lifetime prevalence of forced intercourse being 19.3% among women compared to 1.7% for men (Breiding, 2014). In addition, the prevalence of depression and suicidal behaviors among female adolescents is two times greater than male adolescents, with nearly four out of ten females reporting depressed mood, two out of ten considering suicide or planning a suicide attempt, and more than one out of ten actually attempting suicide (Kann, 2016). Lastly, reducing violent exposures that are more prevalent or induce a greater risk of mental health morbidity among female adolescents has been identified as an avenue to attenuate this disparity (Dunn, 2012). Therefore, this study will address gaps in the literature on the differences in violent exposure types, including peer-induced, and the accumulation of violent exposures, while also determining other risk factors associated with depressed mood and/or suicidal behaviors specific to female adolescents.

In addition to gender, racial and ethnic disparities exist, with Hispanics having the greatest risk for suicidal behaviors (Lowry, 2014). Overall, trends indicate an increase in the proportion of

adolescent females who seriously considered suicide from 17.4% in 2009 to 19.3% in 2011 (Lowry, 2014). Also, suicide remains as the second leading cause of death for females aged 15-19 years, accounting for 15.6% of total deaths in 2014 (Heron, 2016). In order to address suicide and related behaviors, there is a need to identify subpopulations at greater risk and the contribution of violent exposures.

With the emergence of electronic bullying and the social popularity of daily electronic communication among high school-aged students, they now have a greater risk of exposure to an additional violent behavior (Lenhart, 2012; Madden, 2013). When compared to personal bullying, electronic bullying has been found to induce more harm to mental health (Bannink, 2014; Hinduja, 2014). This is of public health concern, given that violence victimization serves as a risk factor for future re-victimization and progression to perpetrating behaviors, and an additive relationship with suicidal behaviors is plausible given evidence that childhood exposures to multiple forms of adult-inflicted maltreatment increases this risk (Deeds, 2007; Miller, 2013). Multiple studies have indicated that adverse life experiences are predictive of internalizing mental health conditions, such as depression and suicidal behaviors, among individuals with specific genetic profiles; however not consistently (Currier, 2008). In regard to the genetic link with adolescent depression, females have been identified as being the most susceptible to expression via chronic stressors, specifically those induced by peers (Hankin, 2015). These early-life violence exposures serve as stressors that compromise serotonergic system development and functioning, increasing the risk for suicidal behavior that can persist into adulthood (Currier, 2008; Sachs-Ericsson, 2016).

Epidemiological studies of specific violent exposures, including peer-induced during adolescence, in relation to suicidal behaviors are scarce and inconclusive, although it has been found that cumulative exposures to violence among adolescents may be of greater importance

(Finkelhor, 2009; Miller, 2013; Zimmerman, 2016). Also, there is a need to better understand the relationship between violence exposures and internalizing mental health conditions particularly among adolescent females (Herrman, 2012; NIH, 2011).

The research objectives of this study include: 1) determining if the risk of depressed mood and/or suicidal behaviors among female adolescents varies between unique violent events; 2) evaluate if there is a dose-response relationship with the number of violent exposures and the risk of depressed mood and/or suicidal behaviors, including a sensitivity analysis with attempted suicides that resulted in medical treatment serving as the highest severity outcome; and 3) build a model to identify other risk factors and protective behaviors associated with the outcome. The hypothesis for objective one was that there would be specific violent risk exposures that separated from the other exposures, such as forced sexual intercourse and electronic bullying. For objective two a gradient relationship between the number of exposures and risk for the outcome was anticipated, even when controlling for other risk factors. The expectation for objective three was that obtaining at least eight hours of sleep and higher levels of physical activity would serve as a protective factors, and that there would be interactions between violent exposures that would induce even greater risk of depressed mood and/or suicidal behaviors.

Inclusion criteria were female high school students in the US, grades 9 through 12, in public or private schools who participated in the 2015 YRBS. This study was limited to female students because of limited research focusing on adolescent female victims of violence and due to their susceptibility to associated mental health morbidity. Of the 15,624 completed and analyzable YRBS questionnaires gathered in 2015, 7,751 (48.7%) high school students identified themselves as female.

The YRBS cross-sectional survey of high school students is administered every two years by the CDC with the purpose of monitoring health risk behaviors that develop in adolescence, which contribute to social problems, morbidity, and mortality among youth (Kann, 2016). The YRBS dataset uses standardized data collection and management procedures, and provides a nationally representative sample of the target population. Survey methods ensure anonymity, avoid skip patterns for privacy, and apply other techniques that have been shown to increase the validity of responses to sensitive questions (Kann, 2016; Krumpal, 2013). The 2015 survey consisted of ninety-nine total questions, the majority of response options are categorical in nature, with multiple response choices, and categorical frequencies are captured for numerically related questions. Revisions have occurred over time, however with only minor changes. Two test-retest reliability studies have been completed; after the assessment in 2000, questions that did not meet the desired level of validity were deleted or revised (Brenner, 2002; Kann, 2016). Refer to the CDC report for additional information and resources on YRBS data collection methods (Kann, 2016).

The primary outcome focused on depressed mood and suicidal behaviors, as captured in the 2015 YRBS National High School Survey, pages 7 and 8. The outcome was defined as a binary categorical variables with "yes" indicating at least one positive response to the following: a) "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?" b) "During the past 12 months, did you ever seriously consider attempting suicide?" c) "During the past 12 months, did you make a plan about how you would attempt suicide?" d) "During the past 12 months, how many times did you actually attempt suicide?" (CDC, 2016d).

The violence behavior variables were categorical and defined as those responding that the event had occurred at least one time, or "yes" when asked in a binary fashion. Variables were separated

into violent categories and subcategories, due to the questions on weapon carrying and physical fighting being followed by more specific questions within those groups. The nine variables for the violent categories included: carrying a weapon, absence from school due to feeling unsafe, threatened or injured with a weapon, physical fighting, forced sexual intercourse in their lifetime, physical dating violence, sexual dating violence, bullying, and electronic bullying. The four variables for the violent subcategories included: carrying a weapon at school, carrying a gun, physical fighting at school and physical fighting with an injury that resulted in needing medical treatment. Variables related to physical fighting and carrying a weapon were considered violence-related behaviors, and the others were considered violence-related victimization. The specific questions for the violence variables and the other risk factors included in the models are available on the CDC website (CDC, 2016d).

The analysis of depressed mood and/or suicidal behaviors of those exposed to specific violent events compared to female adolescents who were not exposed used a multivariable logistic regression model controlling for race/ethnicity and academic grade. For each exposure type, the risk of the outcome, with and without adjustment for exposure to the other violent behaviors, were calculated to determine if the rank order from highest to lowest risk remained consistent. The number of exposures for the violent categories were summed as an ordinal composite score ranging from zero to nine. The dose-response analysis for at least one outcome from depressed mood to considering, planning and attempting suicide, with the number of unique violent event exposures as an independent variable, were also tested using logistic regression. A multivariate model was built using modified purposeful selection techniques, in a stepwise fashion, to determine additional covariates for inclusion in the model (Hosmer, 1999 & 2005). Covariate reduction was completed for all of the variables within each risk behavior category of the survey with race and grade included in every model. A significance level *p*-value *(p)* <0.05 was required for retention and clinical judgment was applied for the final selection of variables.

Secondary analyses included tests for interactions of violence exposures with the amount of sleep and level of physical activity, factors that could potentially decrease the risk of the outcome (Babiss, 2009; Wong, 2011). Additional dose-response analyses for multiple outcomes used a multinomial logistic regression. The categorical frequencies of suicide attempts were tested in an ordinal logistic regression model to assess the impact of multiple violence exposures. A sensitivity analysis was conducted with attempted suicides that resulted in medical treatment serving as the highest severity outcome.

All analyses used the sample weights provided by the CDC to account for the complex survey design's primary sampling units (generally counties), strata (based on urban/rural and percentages of minorities), and weights (based on student sex, race/ethnicity, grade, and adjusted for school/student nonresponse and oversampling of black and Hispanic students) (Kann, 2016). All analyses utilized SAS® (SAS Institute Inc., Cary, NC) version 9.4 SURVEY procedures which accounted for the stratum, cluster/primary sampling unit and weight values provided in the dataset. This study was granted protocol exempt status by the Indiana University Institutional Review Board on August 18, 2016.

Of the 7,551 female respondents, over one half were white (55.5%) while 22.4% were Hispanic and 13.1% were black. Approximately one fourth were in each grade, ninth through twelfth, as shown in Table 3.1. Three-fourths of the female students were nearly equally distributed between 15, 16 and 17 years of age, and the remaining one-fourth was split between those younger than 15 and older than 17. The prevalence of each outcome and each violent event among female students is also presented in Table 3.1, stratified by race/ethnicity and grade level. The most common outcome was depressed mood (39.8%), followed by ever considered committing suicide (23.4%), planned suicide (19.4%), and at least one suicide attempt (11.6%), with approximately one-third

(31.7%) of these students reporting that the attempt required treatment by a doctor or nurse. The three most prevalent violent exposures included bullying (24.8%), electronic bullying (21.7%), and physical fighting (16.5%). Approximately 75% of females reported one or more unique violent exposures, with two unique violent events occurring the most frequently (29.2%). Seven of the interpersonal violent risk behaviors had significant differences by race/ethnicity and/or grade.

Among the violence-related victimization categories listed in Table 3.2, the three associated with the greatest risk of depressed mood and/or suicidal behaviors (unadjusted for the other violent events but controlled for race and grade) were feeling unsafe (OR=5.11; 95% CI=[3.39, 7.71]), electronically bullied (OR=4.34; 95% CI =[3.64, 5.18]) and forced sexual intercourse within one's lifetime (OR=4.19; 95% CI =[3.38, 5.20]). These remained the top three when adjusting for all other violent events (p<0.01); however, being threatened or injured with a weapon on school property was no longer statistically significant (p=0.666) when adjusted for the other violent events. Among the violence-related behaviors, physical fighting induced more risk than carrying a weapon. Among the subcategories, physical fighting that resulted in an injury needing treatment by a health care professional generated the greatest risk (OR=5.31; 95% CI=[3.03, 9.30]), followed by carrying a weapon at school (OR=3.91; 95% CI=[2.32, 6.60]), and physical fighting on school property (OR=2.38; 95% CI=[1.77, 3.21]). Physical fighting that resulted in an injury needing treatment and carrying a weapon at school remained significant when adjusted for other nonrelated violent exposures (p<0.001), however physical fighting on school property was no longer statistically significant (p=0.345). Carrying a gun was not statistically significant in either model (p=0.156 and 0.461, respectively). Race and grade were statistically significant in the adjusted model (both p<0.001). With ninth grade as the reference group, twelfth grade appeared to be protective with an OR of 0.65 (95% CI =[0.49, 0.85]) and with white as the reference group, Hispanics and other races had a greater level of risk with an OR of 1.49 (95% CI=[1.16, 1.93]),

and 1.62 (95% CI=[1.17, 2.23]), respectively. There was not a significant interaction between race and grade.

Being electronically bullied appeared to induce greater risk than being physically bullied when controlling for other violent events, 2.51 (95% CI=[2.02, 3.13]), versus 1.43 (95% CI=[1.13, 1.79]), respectively. Also, having at least one violence-related victimization resulted in a 4.17 (95% CI=[3.67, 4.73]), times risk of depressed mood and/or suicidal behaviors than those not exposed, this remained significant when adjusted for violence-related behaviors with an odds ratio of 3.79 (95% CI=[3.33, 4.30]), as shown in Table 3.2. The odds ratio of the outcome was 2.90 (95% CI=[2.36, 3.55]) for violence-related behaviors, which remained significant when adjusted for violence-related victimization with an odds ratio of 2.31 (95% CI=[1.81, 2.96]). Comparing the odds ratios of these two groups indicated a greater risk of depressed mood and/or suicidal behaviors when adolescent females were victimized.

In regard to dose-response relationships, as the accumulation of the number of exposures to unique violent events increased, the probability of reporting depressed mood and/or suicidal behaviors increased (Figure 3.1). The point at which the probability of at least one outcome significantly exceeded the probability of no outcomes was exposure to three unique violent events. Therefore, female students' likelihood of the outcome increased more than fifty percent when exposed to three or more unique violent events. When adjusting for other risk behaviors that were significantly associated with mental health conditions, females exposed to one unique violent event had a 1.40 (95% CI=[1.33, 1.48]) times risk of at least one outcome from depressed mood to attempted suicide than students with no exposures, $p<0.01$, and this risk increased exponentially as the number of exposures increased (Table 3.3). Grade was not statistically significant in the final model, however race was statistically significant ($p<0.05$); Hispanics had a significantly greater risk of depressed mood and/or suicidal behaviors than whites (OR=1.34;

95% CI=[1.08, 1.66]). Sleeping eight or more hours on school nights, playing on sports teams, and speaking English well appeared to be protective factors. Being physically active, smoking, drug use, and four or more sexual partners did not have a significant impact on depressed mood and/or suicidal behaviors. The pre-specified tests for interactions were not statistically significant.

When analyzing the cumulative number of outcomes from depression to attempted suicide (i.e. zero through four), the additional dose-response analyses confirmed that the number of violent events had a positive gradient association with the number of outcomes as shown in Table 3.3. When the outcome was specifically suicide attempts, as the number of violent events increased the number of attempts increased; this association was slightly stronger than the aggregate outcome of depressed mood and/or suicidal behaviors. For the sensitivity analysis, when considering depression as the least severe outcome and an attempted suicide that resulted in medical treatment as the most severe, a positive dose-response pattern was also observed.

This study demonstrated that among female adolescents who experienced violence, the risk of depressed mood and/or suicidal behaviors was consistently greater than those who were not exposed. There was a lack of distinct severity levels for each unique violent event, given overlapping confidence intervals, with the exception of electronic bullying inducing more risk than bullying, and exposure to violence-related victimizations inducing greater risk than violence-related behaviors. Also, a dose-response relationship was observed, with greater risk of depression and/or suicidal behaviors as the number of exposures to unique violent events increased, even when controlling for other risk behaviors. As for the sensitivity analyses, those with the greatest number of exposures to violence also had the greatest risk of an attempted suicide that required treatment.

When controlling for other violent events, being electronically bullied appeared to induce a greater risk for depressed mood and/or suicidal behaviors than being bullied on school property. Supportive research has identified attributes of electronic bullying that contribute to the severity, including: anonymity, number of online witnesses, level of cruelty, and lack of bystanders to intervene (Bannink, 2014; Hinduja, 2014). Also, physical bullying may have a shorter and immediate impact, whereas electronic bullying remains persistent due to continued presence in online communications. In both unadjusted and adjusted models for other violent events, feeling unsafe, being electronically bullied, and exposure to forced sexual intercourse induced the highest level of risk. The latter two findings were consistent with other research (Bannink, 2014; Waldrop, 2007). However, absence from school due to feeling unsafe at the school, or while travelling to/from school, was more difficult to interpret. It was unclear if feeling unsafe was a response to victimization or measured additional violent events, such as indirect community violence, for which females have been found to experience more adverse mental health outcomes than males (Javdani, 2014). Either way, this association raises concerns about the impact of school, bus, and community environments. Overall, victimization appeared to induce a greater risk of internalizing mental health symptoms and behaviors among adolescent females.

A potentially stronger measure of risk was the cumulative number of exposures to violent events, which aligns with the results of recent youth research on indirect and direct exposures to violence (Zimmerman, 2016). One-half of females had two or more unique violent exposures, with three being a turning point for a greater chance of having the adverse outcome than not being exposed. The multivariable model confirmed the dose-response relationship, revealed the characteristics of subpopulations with greater risk, and identified protective behaviors. Participation in team sports served to reduce risk, most likely both the social and physical aspects of this extra-curricular activity protect adolescents (Hallal, 2015; Riese 2015). Prescription drug abuse among female adolescents is a concern, particularly given the association with suspected suicide attempts and

hospitalizations (Zosel, 2013). However, specific variables within a risk-behavior category are highly correlated, and other individual risk behaviors should not be dismissed. Seemingly more important are the general concepts of alcohol and other drug use, risky sexual behaviors and tobacco use. Also, given the strong association with difficulty concentrating/remembering and insomnia, which are symptoms of depression, teachers and legal guardians should be cognizant of warning signs, such as a drop in academic performance (APA, 2013; Borofsky, 2013). The extended use of video games and computers introduces an interesting paradigm, perhaps providing more opportunities for electronic bullying to occur or serving as an indicator of unmet mental health needs; raising the question if these could serve as avenues for interventions (Sampasa-Kanying, 2015). A finding in need of further research involves adolescents whose native language is not English, research has indicated that Hispanic females experience more bullying and subsequent depression, however the role of language skills was unclear (Lorenzo-Blanco, 2016).

The effects of grade level need to be interpreted in relation to trends in student dropout rates for high school. Specifically, the dropout rates are 2 to 3 times higher among Hispanics and blacks, and those with disabilities, including those with impaired abilities to concentrate, remember or decision making (Stark, 2015; Sumner, 2015).

A strength of this research is the use of YRBS data, a nationally representative sample of high school students where multiple violent risk factors and behaviors related to both depression and suicide were measured. In addition, the survey sample sizes provided adequate power to address the primary research questions. Multiple risk behaviors and possible confounders from the survey were available to be included in the multivariate analyses. The YRBS survey collection and data management practices included methods to reduce non-response bias, selection bias and omit surveys with illogical responses (Kann, 2016). This study was uniquely focused on female

high school students and included peer-induced violence exposures during adolescence, while providing a comprehensive analysis of the dose-response relationship between violent exposures and depressed mood and/or suicidal behaviors. The results evaluated the severity of each violent exposure independently, as well as the cumulative effects of multiple exposures.

This study has the limitations of cross-sectional study designs in which cause and effect cannot be specifically established given that it is unknown if the exposure preceded the outcome. These survey questionnaires were completed by high school students, thus there is concern with the known limitations of self-reported behaviors and experiences. However, techniques used by the CDC reduce reporting bias (Kann, 2016; Krumpal, 2013). The survey was administered in schools, therefore, adolescents who were not enrolled or who were absent on the surveillance day with unsuccessful follow-up efforts would be underrepresented. These students are more likely to have risky behaviors compared to those who attend school (Kann, 2016). The national survey used methods to ensure representativeness at the national level, therefore these same trends may not be observed at the state-level or smaller regions.

Possible confounding variables that were unavailable or incomplete and may have resulted in spurious results, included: community environment, family circumstances, school attributes, individual risk factors for poor mental health, receipt of treatment, sexual orientation, subsequent exposures to violence. The manner in which some questions were asked may have resulted in greater variability, for example being threatened with a weapon versus injured with a weapon, and the lack of clarity in regard to what an absence from school due to feeling unsafe was measuring. Associations within smaller racial/ethnic groups were not addressed due to inadequate sample sizes. Finally, mounting evidence shows that genetics plays a role in the development of depression and suicide: however, we were not able to adjust for genetic factors in analysis due to lack of genetic data from the YRBS (Currier, 2008; Sachs-Ericsson, 2016).

Hispanic females appear to be a specifically vulnerable population which needs a better understanding, and other smaller racial/ethnic groups may also be at greater risk, specifically those who are not proficient in the English language. There is also a need to explore gender-related sociocultural barriers to accessing mental health services and participating in team sports. With the adoption of electronic means for communication and socializing, these same forums are in need of more research as potential avenues for reaching at risk adolescents and providing needed services (Sampasa-Kanyinga, 2015). More gender-specific research for middle school and elementary school ages are needed, as are local research efforts for informing intervention programs.

There are important touch points between adolescents and health care practitioners that provide opportunities to address mental health services and resources for preventing violence exposures. Recent research has called for the engagement of health care providers to screen adolescents for violent exposures, provide resources for stopping violence, and address mental health needs (Duke, 2014; Sumner, 2015). This research elevates that need for female adolescents who have been treated for failed suicide attempts, as well as those being treated for injuries from physical fighting. The school system also needs to adopt policies for identifying at risk adolescents and ensuring they receive appropriate services, particularly given the implications to academic performance (Borofsky, 2013). Public health professionals need to continue to monitor trends over time to inform new policies that address both the reduction in violence-related victimization and risk behaviors, and increasing access to mental health services among female adolescents to better prevent suicide and related adverse outcomes.

In this nationally representative study of female high school students, we identified a comprehensive dose-response relationship between the number of unique violent events,

including peer-induced, and depressed mood and/or suicidal behaviors. This emphasizes the need to monitor both traditional and new forms of violence, such as e-bullying. Violence prevention efforts need to focus on reducing the number of exposures, and these efforts need to begin early in the course of life, with schools serving as an important target environment and potential setting for facilitating access to mental health services. Also protective factors need to be leveraged, such as participation in team sports. Efforts to increase accessibility and broaden these activities such that they appeal to more students are in need of consideration. There is also a need to address trends in depressed mood and/or suicidal behaviors as related to violent aggression, risks associated with exposure frequency, the role of other risk and protective factors, and the implications of sustaining an injury in need of treatment for an aggressive behavior.

TABLE 3.1 Prevalence of Depressed Mood, Suicidal Behaviors, and Violent Risk Behaviors (YRBS Females, 2015)

Variable	Race/Ethnicity (%)			
	White n=4134	Black n=975	Hispanic n=1668	Other n=678
Total	55.5	13.1	22.4	9.1
Depressed/Suicidality				
Depressed mood*	37.9	33.9	46.7	42.8
Considered suicide*^	22.8	18.7	25.6	28.8
Planned suicide^	18.4	17.3	20.7	24.7
Attempted suicide*^	9.8	10.2	15.1	15.0
Attempted suicide treated	*3.4*	*3.6*	*4.5*	*3.4*
Violent Risk Behaviors				
Bullied*^	29.1	15.1	19.3	26.2
Electronically bullied*	26.0	11.9	16.7	22.3
Physical fighting*^	13.5	25.4	18.6	18.3
Fighting on school property^*	*3.2*	*9.4*	*7.1*	*3.6*
*Fighting injured and treated**	*0.9*	*3.4*	*3.0*	*1.5*
Sexual dating violence	16.6	11.7	14.2	16.7
Physical dating violence	11.9	12.2	11.4	10.6
Forced sexual intercourse^	9.9	10.3	10.1	11.8
Carrying a weapon	8.1	6.2	7.1	7.0
Carry a weapon: school	*1.7*	*2.1*	*2.9*	*1.9*
Carry a gun	*1.4*	*1.7*	*1.9*	*1.4*
Feeling unsafe	5.4	6.4	7.4	5.8
Threatened/injured weapon^	4.3	6.5	4.7	3.9
# of Unique Violent Events				
0	24.2	22.8	28.7	21.1
1	15.1	16.3	14.6	13.1
2	27.8	30.8	30.0	34.7
3	16.3	14.5	13.0	14.1
4	8.0	6.6	6.6	9.3
5	5.7	5.1	4.0	3.5
6	1.7	1.9	1.4	1.4
7	0.9	1.1	1.0	2.1
8	0.3	0.5	0.2	0.4
9	0.1	0.4	0.5	0.4

Note: Sexual and dating violence was among those dating. Weighted mean for unique number of violent events: 1.97 (95% CI=[1.82, 2.11]). * $p<0.05$ for race/ethnicity, ^ $p<0.05$ for grade.

TABLE 3.1 *(Continued)* Prevalence of Depressed Mood, Suicidal Behaviors, and Violent Risk Behaviors (YRBS Females, 2015)

Variable	Grade (%)				Total N=7551
	9th n=1985	10th n=1992	11th n=1783	12th n=1769	
Total	26.3	26.4	23.7	23.5	100.0
Depressed/Suicidality					
Depressed mood*	41.5	40.1	40.9	36.3	39.8
Considered suicide*^	26.5	25.7	22.1	18.6	23.4
Planned suicide^	22.5	21.6	17.2	15.7	19.4
Attempted suicide*^	15.1	13.0	10.2	7.2	11.6
Attempted suicide treated	*4.7*	*3.9*	*3.4*	*2.3*	*3.7*
Violent Risk Behaviors					
Bullied*^	29.0	25.5	24.2	19.8	24.8
Electronically bullied*	22.7	23.2	21.4	19.5	21.7
Physical fighting*^	22.6	17.6	12. 8	12.0	16.5
Fighting on school property^*	*8.2*	*4.6*	*4.1*	*2.5*	*5.0*
*Fighting injured and treated**	*2.5*	*1.4*	*1.6*	*1.4*	*1.8*
Sexual dating violence	17.6	15.8	14.9	13.9	15.6
Physical dating violence	11.1	10.9	11.6	12.9	11.7
Forced sexual intercourse^	9.4	7.9	12.0	11.9	10.3
Carrying a weapon	6.6	7.2	8.0	8.0	7.5
Carry a weapon: school	*1.9*	*2.2*	*1.9*	*2.0*	*2.1*
Carry a gun	*1.3*	*1.6*	*1.4*	*1.7*	*1.6*
Feeling unsafe	7.7	6.3	5.3	4.3	6.0
Threatened/injured weapon^	6.2	5.5	2.9	3.2	4.6
# of Unique Violent Events					
0	18.1	23. 7	27.4	30.9	24.8
1	13.3	14.8	16.8	15.1	14.9
2	32.2	31.4	26.3	26.3	29.2
3	17.4	14.4	15.2	13.9	15.3
4	9.3	6.4	7.1	7.5	7.6
5	5.3	6.0	4.7	4.1	5.0
6	2.6	1.4	1.2	1.3	1.7
7	1.3	1.2	1.4	0.3	1.0
8	0.2	0.4	0.1	0.4	0.3
9	0.4	0.3	0.1	0.3	0.3

Note: Sexual and dating violence was among those dating. Weighted mean for unique number of violent events: 1.97 (95% CI=[1.82, 2.11]). * $p<0.05$ for race/ethnicity, ^ $p<0.05$ for grade.

TABLE 3.2 Odds Ratio of Depressed Mood and/or Suicidal Behaviors for Violent Events (YRBS Females, 2015)

Variable	Unadjusted		Adjusted	
	OR	95% CI	OR	95% CI
Violence-related victimization	4.17	[3.67, 4.73]	3.79	[3.33, 4.30]
Feeling unsafe	5.11	[3.39, 7.71]	2.68	[1.68, 4.28]
Electronically bullied	4.34	[3.64, 5.18]	2.51	[2.02, 3.13]
Forced sexual intercourse	4.19	[3.38, 5.20]	2.23	[1.73, 2.86]
Physical dating violence	3.81	[2.84, 5.10]	1.77	[1.27, 2.46]
Bullied at School	3.65	[3.14, 4.24]	1.43	[1.13, 1.79]
Sexual dating violence	3.20	[2.63, 3.90]	1.62	[1.29, 2.03]
Threatened/injured weapon	2.82	[2.00, 3.96]	*0.91	[0.59, 1.40]
Violence-related behaviors	2.90	[2.36, 3.55]	2.31	[1.81, 2.96]
Physical fighting	3.07	[2.40, 3.92]	1.85	[1.41, 2.44]
Fighting injured and treated	*5.31*	[*3.03, 9.30*]	*2.15*	[*1.02, 4.52*]
Fighting on school property	*2.38*	[*1.77, 3.21*]	*1.26*	[*0.78, 2.02*]
Carrying a Weapon	2.83	[2.13, 3.75]	2.06	[1.45, 2.91]
Carrying a weapon at school	*3.91*	[*2.32, 6.60*]	*2.42*	[*1.14, 5.10*]
Carrying a gun	*1.45*	[*0.87, 2.43*]	*0.74*	[*0.33, 1.65*]

Note: Reference group are those not exposed to the violent event(s). All models were adjusted for grade and race, all violent events were included in the adjusted model. For the unadjusted model, all *ps* significant at <0.001, except carrying a gun (p=0.156). For the adjusted model, all *ps* significant at <0.01, except threatened/injured with a weapon (p=0.666), fighting on school property (p=0.345), and carrying a gun (p=0.461).

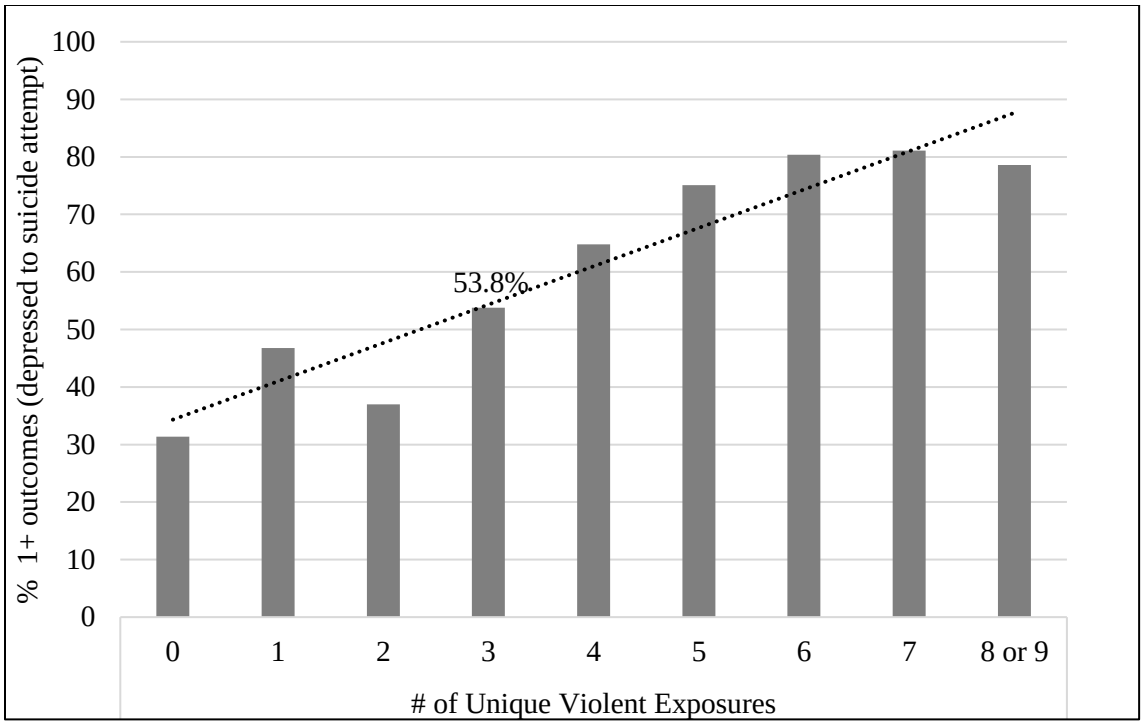


FIGURE 3.1 Percent Distribution of Depressed Mood and/or Suicidal Behaviors by Number of Unique Violent Events (YRBS Females, 2015)

Note: Possible outcomes included depressed mood, considered suicide, planned suicide, and attempted suicide. All models were adjusted for grade and race. The point at which the probability of at least one outcome exceeds the probability of no outcomes is three unique violent events. $p<0.001$ based on logistic regression adjusted for other risk factors. The number of events for students with eight or nine events were pooled due to small numbers (<30).

TABLE 3.3 Final Model: Odds Ratio for Depressed and/or Suicidal Behaviors, Associated Risk Behaviors and Number of Unique Violent Events (YRBS Females, 2015)

Variables in Final Model		OR	95% CI
# of unique violent events:	1 vs. 0	1.40	[1.33, 1.48]
	2 vs. 0	1.97	[1.77, 2.20]
	3 vs. 0	2.77	[2.35, 3.26]
	4 vs. 0	3.89	[3.12, 4.84]
	5 vs. 0	5.46	[4.15, 7.17]
	6 vs. 0	7.66	[5.51, 10.64]
	7 vs. 0	10.75	[7.32, 15.78]
	8 vs. 0	15.10	[9.73, 23.40]
	9 vs. 0	21.20	[12.93, 34.70]
Difficulty concentrating, remembering		4.77	[4.09, 5.56]
Sexually active (≥1 partner, 3 months)		1.68	[1.40, 2.03]
Electronic vapor use (≥1 day, 30 days)		1.60	[1.24, 2.06]
Video games/computer use (≥3 hours/day)		1.52	[1.24, 1.86]
Current alcohol use (≥1 drink, 30 days)		1.43	[1.10, 1.87]
Prescription drug use (lifetime)*		1.43	[1.04, 1.96]
Self-identify as overweight		1.31	[1.10, 1.56]
Sleep (< 8 hours/school night)		1.28	[1.02, 1.61]
Sports team participation (= 0)		1.30	[1.06, 1.59]
Speak English well (No)		4.21	[1.68, 10.54]
Other Variables of Interest			
Physically active (≥ 60 minutes, ≥ 5 days)		0.89	[0.67, 1.17]
Current cigarette use (≥1 time, 30 days)		1.34	[0.89, 2.00]
Current marijuana use (≥1 time, 30 days)		1.27	[0.93, 1.75]
Cocaine use (lifetime)		0.94	[0.60, 1.49]
Multiple sex partners (≥4 partners, lifetime)		1.04	[0.72, 1.51]

Note: Model controlled for race and grade. All variables in final model were statistically significant ($p<0.05$), and for # of unique violent events ($p<0.001$). Other variables tested in the model that were not significant: physically active ($p=0.385$), current smoker ($p=0.158$), current marijuana user ($p=0.134$), cocaine use ($p=0.806$), and four or more sex partners ($p=0.806$). * Prescription drug abuse is a positive response to taking a prescription medication (such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription.

CHAPTER 4

TRENDS IN DEPRESSED MOOD AND SUICIDAL BEHAVIORS AMONG HIGH SCHOOL-AGED FEMALES WHO ENGAGED IN PHYSICAL FIGHTING

The risk of depression or any mental health condition by the age of 18 years is two-fold higher among adolescent victims of violence and three-fold higher for those who also participate in aggressive behaviors (Lereya, 2015). Aggressive behaviors, such as physical assault and fighting with a weapon, are two to three times more common among previously violently victimized adolescent females (Deeds, 2007). Victimized females often suffer from internalizing mental health conditions such as depression and suicide, which leaves them at risk of violent re-victimization (Deeds, 2007; Ruback, 2014). These consequential events and the accumulation of psychological adverse outcomes are known to precipitate externalizing behaviors, such as aggression (Ruback, 2014; van der Put, 2015). However, the level of risk for becoming a perpetrator is differential, with greater risk for females who are victimized at a young age and exposed to higher frequencies and/or multiple forms of violence (Deeds, 2007; van der Put, 2015).

The prevalence of physical fighting among female high school students in the U.S. in 2015 was 16.5%, with the highest prevalence among black females at 25.4%, followed by Hispanics at 18.6%, and whites at 13.5% (Kann, 2016). Despite a significant linear decrease in the prevalence of physical fighting among a national sample of all high school students from 42.5% in 1991 to 22.6% in 2015, geographical disparities were noted, with ranges from 14.9% to 27.3% across 31 states and from 13.9% to 42.5% across 19 large urban school districts (Kann, 2016). The discrepancies are concerning given that the propensity to act violently is a reflection of chronic exposure to violence or a threatening environment with recurrent distress having the potential to invoke the desire to escape including thoughts of suicide (Giletta, 2016; Wilkins, 2014).

Among females ages 15 to 24 years, the rate of suicide in the US has increased by approximately 50% from 1999 to 2014, and among ages 10 to 14 years the rate has tripled (Curtin, 2016). One of the strongest predictors for suicidal death is the history of a previous suicide attempt (Hawton, 2013). There is evidence indicating that the risk of suicidal behaviors among females with aggressive externalizing behaviors is high; however, it is important to address bidirectional violence given that over 95% have also been victims of violence (Lereya, 2015). The mutual occurrence of self-inflicted harm and outward aggression among youth is evident given that the risk of a suicide attempt among more frequent physical fighters is six-times greater than non-fighters (Swahn, 2013). Overall among adolescent females who are both victims and aggressors of violence, the severity and prevalence of mental health conditions is even higher than unidirectional violence (Satyanarayan, 2015; Ulloa, 2016).

From 2009 through 2013, there was a decrease in the annual rate of assault-related injuries treated in US emergency departments among the female adolescent population; however, only assaults with a firearm in the age group 10 to 14 years achieved statistical significance (Bell, 2016). Injuries related to self-harm (all methods) during this same time period, had a statistically significant increase from approximately 275 per 100,000 in 2009 to 387 per 100,000 in 2013 among females 15 to 19 years of age (Bell, 2016). In addition to the risk of acute injuries, as these adolescents mature into adulthood they are more likely to have multiple suicide attempts, a lethal suicide attempt, persistent psychological conditions, physical comorbidities, violent criminal offenses and behaviors, and socioeconomic challenges such as unemployment (Boots, 2009; Goldman-Mellor, 2014; Goldston, 2015).

The scarcity of violence research focused on adolescent females has been noted; thus, the National Institutes of Health, Violence Against Women (VAW) Research Report has called for research in this area that also addresses the risk of mental health disorders and perpetrating

behaviors (Herrman, 2012; NIH, 2011). Overall there is a need to better understand prevalence time trends associated with poor mental health outcomes among female adolescents that exhibit aggressive behaviors, the associated violent risk factors, poly-victimization, and any changes related to the introduction of electronic bullying (any kind of aggression perpetrated through technology) (Gladden, 2013; Lenhart, 2012; Madden, 2013; Ybarra, 2011).

The objective of this study was to analyze changes in the prevalence of depressed mood and/or suicidal behaviors among female high school students who reported physical fighting, from 2001 through 2015 in the U.S., a question that has not been addressed in previous research. It was hypothesized that the prevalence of the outcome among physical fighters had increased during this time period, due to more opportunities for poly-victimization given the introduction of electronic bullying. Addressing the research questions of the present study are important given the recent increase in suicide rates among female adolescents, the current and future health of this vulnerable population, and the societal implications.

Female high school students (grades nine through twelve) enrolled in public and private schools, who participated in the Youth Risk Behavior Surveillance (YRBS) national U.S. survey in the years of 2001 through 2015 were included in this study. Out of the 117,815 total usable questionnaires, 415 were not included in this analysis due to missing data on gender. Of the remaining 117,400 surveys, 59,091 (49.2%) survey responders self-identified as females.

The YRBS is administered every two years by the Centers for Disease Control and Prevention (CDC) and began in 1991. Adolescent health risk behaviors associated with social well-being, morbidity, and mortality are monitored using this survey (Brener, 2013). Multiple risk behavior categories are captured, including: unintentional injuries, violence, sexual behaviors, drug and alcohol use, smoking, dietary behaviors, and physical activity. Only minor revisions to the survey

have occurred over time (Brener, 2013). The CDC designed the survey items and data collection methods to reduce non-response and reporting bias, while also omitting illogical surveys (Krumpal, 2013). Refer to the CDC website for additional information on the YRBS methods and documentation (CDC, 2016a). The data provided a nationally representative sample of the target population, enabled conducting a trends analysis, had large sample sizes to provide sufficient power, and items that adequately addressed the research questions.

The primary outcome of interest was depression, suicidal thoughts and behaviors, which was defined as being present when participants answered "yes" to one or more of the following: a) "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?" b) "During the past 12 months, did you ever seriously consider attempting suicide?" c) "During the past 12 months, did you make a plan about how you would attempt suicide?" d) "During the past 12 months, how many times did you actually attempt suicide?" (CDC, 2016b). The outcome was analyzed as a binary categorical variable to measure the presence of any sign or symptom of depression and/or suicidal behaviors, with each outcome also being analyzed in the final models. Identifying females exposed to physical fighting, when analyzed as a binary variable, required a response of at least "1 time" to the following survey question: "During the past 12 months, how many times were you in a physical fight?" (CDC, 2016b). Also, physical fighting frequency categories were divided into three groups based on the distribution of responses, resulting in the four following categories: zero times, one time, two to three times and four or more times.

In addition to physical fighting there were four other violent behaviors that were consistently captured in the survey from 2001 through 2015 that were analyzed as binary categorical responses in the final models. The variables, which are referred to as "other violent events," included: carrying a weapon in the last 30 days, being absent from school due to feeling unsafe at

or on the way to/from school in the last 30 days, being threatened and/or injured with a weapon on school property in the past 12 months, and having ever been physically forced to have sexual intercourse. For the 2011 to 2015 models, items to gather information on two other violent events were added to the survey and included in this study: having been bullied on school property and electronically bullied in the last 12 months. For the alternative models, the other violent events were replaced by a summation of the number of violent exposures, with the ordinal composite score ranging from zero to four for the 2001 to 2015 model, and zero to six for the 2011 to 2015 model.

Race/ethnicity and school grade were controlled in all of the models, and a *p*-value (p) < 0.05 was required for statistical significance. Linear and non-linear methods were used to conduct the trends analyses. A logistic regression analyses was conducted to test for linear, quadratic or cubic trends (CDC, 2016c). In order to identify possible inflection points when a nonlinear trend was detected, the odds ratios for each survey year were compared for significant changes (i.e. contrast statement) to the average of the other survey years. Tests for linearity were then conducted for each line segment before and after the inflection, while noting increasing or decreasing trends. In order to ensure comparability with SUDAAN, analytical options for the trends analyses that are recommended for use in SAS for complex survey data were applied (Chen, 2006). Using the same trend analysis methods, a sensitivity analysis was conducted with the exposure of physical fighting requiring medical treatment, to determine if any significant changes in depressed mood and/or suicidal behaviors had occurred over the time period for this specific exposure.

The associations between the other violent events and the outcome were measured using Pearson's correlation methods after applying the sampling weights. These results and prevalence trends for the outcome among physical fighters were evaluated to determine which, if any, of the other violent events trends mirrored the primary trends analysis results.

The final models were built to evaluate the inclusion of additional covariates into the trends analysis model when controlling for the trend type (i.e. linear, quadratic or cubic). Modified purposeful selection techniques were used to build the final multivariate logistic regression models, which used stepwise methods to evaluate covariates for inclusion in the model (Hosmer 1999 & 2005). The first step in variable reduction was to test each of the other violent risk events separately to determine if they were statistically significant in the model when controlling for race, grade, survey year and physical fighting. A significance level of $p<0.05$ was required for retention, forward and backward selection techniques were then applied to determine if any of the other violent events should be excluded.

For each of the analyses, SAS® (SAS Institute Inc., Cary, NC) version 9.4 SURVEY procedures were used. Due to the three-stage cluster sample design used by the CDC to obtain a nationally representative sample of high school students, all of the analyses applied the provided sample weights, accounting for the sampling units, strata, and weights (CDC, 2016a). Sampling was performed at the county level, strata accounted for urban/rural and minority composition, and weights were used due to the oversampling of Hispanic and black students, while also accounting for school/student nonresponse, student sex, race/ethnicity, and grade. This study was granted protocol exempt status by the Indiana University Institutional Review Board on August 18, 2016.

From 2001 through 2015, the weighted sample included 57,708 female students. Within the study population the prevalence of depressed mood and/or suicidal behaviors was 43.0%, and participation in a physical fighting in the past 12 months was 23.3% (Table 4.1). Hispanics had the highest prevalence of depressed mood (50.5%), and blacks had the highest for physical fighting (33.3%). Overall, the highest prevalence of depressed mood and/or suicidal behaviors occurred in 2015 at 45.1% and the lowest in 2009 at 39.8%; physical fighting was the highest in

2005 at 28.1% and the lowest in 2015 at 16.5%. The prevalence of physical fighting injuries in need of treatment and physical fights occurring on school property are also reported in Table 4.1.

Among females reporting at least one physical fight in the past 12 months, the trends analysis from 2001 to 2015 for the prevalence of depressed mood and/or suicidal behaviors did not have a statistically significant linear (p=0.205) or cubic trend (p= 0.247) (see Figure 4.1). A significant quadratic trend (p<0.001) was present, with an inflection point in 2009. There was a statistically significant linear decrease from 2001 to 2009 (p<0.001), followed by a significant linear increase from 2009 to 2015 (p<0.001). Among physical fighters, the prevalence of depressed mood and/or suicidal behaviors was 65.7% in 2001 and 67.8% in 2015 versus 57.6% in 2009, compared to 37.2% in 2001 and 40.9% in 2015 versus 34.6% in 2009 among those who were not physical fighters. For the other violent events, there was a statistically significant correlation with the outcome (p<0.001), with the exception of threatened and/or injured with a weapon among physical fighters in 2015 (p= 0.329). Among physical fighters, those who also carried a weapon and/or had a history of forced sexual intercourse followed a similar prevalence pattern in the outcome as all physical fighters. The results for the sensitivity trends analysis for physical fighting injuries needing treatment are also shown in Figure 4.1.

The final models resulted in female physical fighters having a greater risk of developing depressed mood and/or suicidal behaviors than those without a history, even when controlling for other violent risk factors, race, grade and the quadratic trend for survey year (Table 4.2). For model 1 (2001-2015), as the frequency in the number of physical fights increased, the level of risk for the outcome also increased. Physical fighting risk increased by frequency: 2.02 (95% CI=[1.89, 2.17]) for one, 2.28 (95% CI=[2.07, 2.52]) for two to three, and 2.50 (95% CI=[2.15, 2.92]) for four or more fights. When the model was analyzed for each outcome separately, an increase in risk consistently corresponded with an increase in physical fighting frequency. In

addition, among those with four or more fights, the level of risk increased with the severity of the outcome, specifically, the risk for depressed mood was 2.25 (95% CI=[1.93, 2.62]), considered suicide 2.74 (95% CI=[2.36, 3.18]), planned suicide 3.00 (95% CI=[2.57, 3.50]), and attempted suicide 4.14 (95% CI=[3.47, 4.94]). The first pattern was not consistently observed in model 2, however a similar pattern for the highest fighting frequency group was observed (2011 to 2015). For model 1 the greatest level of risk for planned suicide, attempted suicide and suicide attempted with injury needing treatment by a healthcare professional was among females with four or more physical fights, when compared to the other violence variables. This pattern was also observed in model 2 (2011 to 2015), which included bullied and electronically bullied as violent risk factors.

Given the relationship between physical fighting frequency and the outcome of depressed mood and/or suicidal behaviors, the prevalence of the other violent risk behaviors among those with the outcome by physical fighting frequency status are depicted from 2001 through 2015 in Figure 4.2. During this time period, the range in prevalence of at least one other violent event by physical fighting status in the past 12 months were as follows: non-physical fighters from 25.1% (2003) to 31.3% (2013), one physical fight from 41.5% (2015) to 45.8% (2013), two to three fights from 46.2% (2011) to 55.9% (2001), four or more fights from 61.8% (2005) to 73.1% (2013). From 2011 to 2015 when accounting for bullying and electronic bullying, the highest prevalence of at least one other violent event occurred in 2013 among those with four or more physical fights at 87.8%, followed by those with two to three fights at 74.5%, then one fight (in 2015) at 70.4% and those with no physical fights at 56.0%. Among adolescent females with a greater frequency of physical fighting in the past 12 months, there is a consistent corresponding greater prevalence of at least one other violent exposure.

The increase in the prevalence for at least one other violent event was notably steeper, approximately 10% to 20% increases, when including bullying versus the subsequent addition of

electronic bullying, approximately 1% to 7% increases (Figure 4.2). Therefore, Table 4.3 depicts the changes in prevalence for the number of other unique violent events among physical fighters. Except for no other violent events when including bullying, the greatest change in prevalence occurs for three or more other violent exposures, which is more than 10% higher each year from 2011 to 2015 when accounting for electronic bullying.

Alternative models were built to determine the risk of depressed mood and/or suicidal behaviors when other violent events were captured as a composite score, shown in Table 4.4. The risk of the outcome is consistently higher for the composite score of other violent events when compared to physical fighting frequency, with the exception of one violent exposure and four or more physical fights for the following outcomes in model 1: considered suicide 2.42 (95% CI=[2.26, 2.61]) vs. 2.69 (95% CI=[2.34, 3.09]), planned suicide attempt 2.53 (95% CI=[2.34, 2.74]) vs. 2.83 (95% CI =[2.42, 3.30]), attempted suicide 2.97 (95% CI=[2.71, 3.27]) vs. 4.06 (95% CI=[3.44, 4.80]), and attempted suicide injury needed treatment 3.72 (95% CI=[3.13, 4.43]) vs. 3.99 (95% CI=[3.18, 5.01]), respectively. This is also observed in model 2, however only for the outcomes of planned suicide attempt and attempted suicide, 2.35 (95% CI=[2.07, 2.67]) vs. 2.51 (95% CI=[1.75, 3.58]), and 3.05 (95% CI=[2.48, 3.76]) vs. 3.26 (95% CI=[2.14, 4.98]), respectively. There was a gradient increase in the level of risk as the number of other violent events increased with the exception of five events compared to six events in model 2. Also, four or more physical fights was not a statistically significant risk factor for the overall outcome (p=0.092) or depressed mood (p=0.311) in model 2 (Table 4.4).

This research found that depressed mood and/or suicidal behaviors among adolescent females who have engaged in at least one physical fight in the past 12 months have been increasing since 2009. Physical fighting remained an important risk factor across the study period, for which there was an increasing level of risk with an increasing frequency of fights and stronger associations

with the severity of the individual outcomes. This was similar to what was observed for the cumulative number of exposure to other violent events. In addition, the introduction of electronic bullying was a significant contributor to the risk of depressed mood and suicidality while also serving as an additional violent event that contributed to poly-victimization.

Research specific to adolescent females with bidirectional violence exposure and the associated mental health outcomes are limited. Thus, this study fills an important gap in knowledge about how the prevalence of depressed mood/and or suicidal behaviors among physical fighters has changed in recent years, particularly with the introduction of electronic bullying. Suicide rates have increased from 1999 to 2014 (Curtain, 2016); however, in this study we observed an initial decline in suicide-related behaviors among female adolescents who were engaged in physical fighting. An increase was observed starting in 2009 with carrying a weapon and forced sexual intercourse contributing to the overall trend. The difference in these trends may be related to changes in the lethality of the means used to attempt suicide, given a notable increase in completed suicides by suffocation (including hanging and strangulation) among females and differences in the sampled populations and study methods (Curtin, 2016). Similar to other research, we found both violent victimization and aggressive behaviors to be strong risk factors for depressed mood and suicidality, a high prevalence of violent victimization among aggressors, and more risk with greater frequency of exposures or behaviors (Gower, 2013; Lereya, 2015; Satyanarayan, 2015; Ulloa, 2016). Overall, these results contribute to how violence adversely effects youth and the means for identifying those who are at risk, which has been identified as an area of need for enabling effective trauma-related services (Donisch, 2016).

The sensitivity analysis also showed an increase in the outcome among females who needed an injury treated by a healthcare professional from a physical fight. In data not reported, an increase in the treatment of such injuries was observed in this population, from approximately 9% in 2009

to 12% in 2013, unlike the numerical decrease reported for the annual rate of assault-related injuries among female adolescents treated in US emergency departments (Bell, 2016). Also, in 2015 approximately three out of every 10 females who needed treatment for an injury from a physical fight also reported needing treatment for a suicide attempt in the past 12 months.

When analyzing more recent data from 2011 to 2015 and accounting for both bullying and electronically bullying, the pattern in risk for physical fighting by frequency is not as strong and the degree of differences in the prevalence of at least one other violent risk event is not as steep; however, both were still present. Across the overall and individual outcomes for depressed mood and suicidal behaviors, the accumulation of at least two other violent events was a consistent and stronger predictor compared to any frequency of physical fighting. Even with the limited number of violent events that were consistently captured during this time period, on average the prevalence of having at least one other violent event was approximately two times greater among physical fighters than non-fighters. When accounting for bullying and electronic bullying, nearly three out of every four physical fighters had been exposed to at least one other violent event which continued to exceed the prevalence among non-fighters. Also, electronic bullying contributed to a rise in the prevalence of three or more violent events among physical fighters. Overall, the introduction of electronic bullying as a new vehicle of violence introduces more opportunities for violence exposure putting adolescent females at even greater risk of depressed mood and/or suicidal behaviors, which also induces more susceptibility to re-victimization and an accumulation of violent events, aggressive behaviors, and other adverse outcomes (Deeds, 2007; Ruback, 2014; van der Put, 2015).

Aggressive behaviors may be serving as a means to cope with prior violence exposures and mental health symptoms, however, similar to alcohol and drugs, the perceived relief is temporary and overtime becomes more deleterious to a populations health and mortality (Donisch, 2016;

NCTSN, 2016). This current study focused on female high school students; however, more research in the younger age groups would be of great value given that 9th graders are were found to have the highest prevalence of physical fighting as well as depressed mood and/or suicidal behaviors (Andrews, 2015). The National Child Traumatic Stress Network (NCTSN) recognizes the phenomena of complex trauma in youth that can result in self-harm and assaulting others, hence advocating for trauma-informed adolescent service practices (NCTSN, 2016). Early interventions have the potential to induce the most public health benefit, the adoption of trauma-informed practices is essential to the school environment and emergency departments, such that adolescent aggressors of violence can be managed using evidence-based methods that recognize the significant burden of past and current violent exposures and mental health sequelae (Lereya, 2015; McLoughlin, 2015; NCTSN, 2016; Sumner, 2015).

Strengths of this study include the use of a database that provided results that are generalizable to female high school students due to the robust methods of the YRBS, which provides a nationally representative sample of high school students in the U.S. Established methods for conducting a trends analysis methods were implemented in this study, with variables that were consistently collected across the study period. The validity of the questionnaires have been established, quality assurance measures are implemented to reduce reporting bias; specifically when considering sensitive questions anonymity is emphasized, skip patterns are not used and other measures are put in place to ensure privacy (Brener, 2013; Krumpal, 2013). Multiple outcomes, violent risk factors, and frequencies were analyzed, providing epidemiological evidence in regard to changes in exposures linked to responses.

One of the key limitations in this study was not being able to establish the sequence of events as related to violent exposures, aggressive behaviors and the outcomes, the use of cross-sectional data lacks the ability to establish cause and effect. Systematic error was possible given the study

period, as interpretation and response behaviors of high school students may have changed. Several of the self-reported questions asked about the prior 12 months making recall bias or errors plausible. Given that a high-risk study population was of interest, these individuals are more likely to enter the juvenile justice system, be expelled or drop out of high school, and would thus be underrepresented in the survey, particularly, students who would have otherwise been in the higher grade levels (CDC, 2016a & 1992; DePaoli, 2015; Donisch, 2016). There are geographical variations that attribute to the risks and outcomes of interest in this study; however, the results are representative only at the national level and cannot be extrapolated to local communities. Exposures to other violent risk events may have been underreported given the limited number of events captured by the YRBS survey. The information on perpetrating behaviors versus violence victimization were limited, due to the manner in which questions were asked; for example, perpetrators of electronic bullying were not captured. Also, other variables of potential interest were not measured, such as past medical and mental health conditions, access to treatment, family-history, economic status, and changes in community and school environments during this time period (CDC, 2016a & 1992).

With the notable decline in physical fighting among female adolescents and acknowledging the introduction of electronic bullying leaves the unanswered question whether the physical form of aggression is being replaced by electronic forms. This is important given the finding that infrequent bullying perpetration and victimization has been found to induce a greater risk for expressing both internalizing and externalizing behaviors (Gower, 2013). Also, since measuring all forms of violence exposure is not feasible, there is a need to determine the appropriate violence variables for measuring risk related to progression, depression and suicidal outcomes, enabling the development of valid methods for collecting reliable data on violence-related victimization and perpetration.

Considering that physical fighting is a recognizable behavior, particularly when it occurs at school or results in an injury, school administrators and health care providers may have opportunities to intervene. Also, this population is at risk of two forms of injuries in need of treatment by a healthcare professionals: injuries sustained from fighting and those by suicide attempts, providing more interactions with the healthcare system, particularly in emergency department settings (Bridge, 2015; Cunningham, 2014; Turecki, 2016). These youth also have a greater risk of entering the juvenile justice system, where their trauma-related sequela also needs to be addressed (Bohnert, 2015). Policies need to be put in place for the integration of evidence-base violence prevention practices into schools, health care settings, and juvenile justice settings, to reduce the number of exposures among youth, while also addressing gender-differences and the mental health needs related to violence (NCTSN, 2016; Ranney, 2014; Sumner, 2015). In addition, continued research on this complex issue, specifically for adolescents with bidirectional violence and poly-victimization, is essential given the disproportionately high level of risk for depressed mood and suicidality in this population.

TABLE 4.1 Prevalence of Depressed Mood and/or Suicidal Behaviors and Physical Fighting (YRBS Females, 2001-2015)

Prevalence of Outcome and Exposure by Year	Depressed /Suicidality		Physical Fighting Total		Physical Fight Injury Treated		Physical Fighting at School		Total Population	
	n	%	n	%	n	%	n	%	n	
2001	3054	43.9	1648	23.9	197	2.9	501	7.2	6953	
2003	3315	45.0	1762	25.1	193	2.6	566	8.0	7361	
2005	2977	43.4	1911	28.1	164	2.4	599	8.8	6858	
2007	2884	41.5	1813	26.5	196	2.9	582	8.5	6942	
2009	3113	39.8	1770	22.9	168	2.2	512	6.7	7816	
2011	3074	41.3	1783	24.4	182	2.6	570	7.8	7446	
2013	3005	44.3	1284	19.2	160	2.4	377	5.6	6780	
2015	3404	45.1	1166	16.5	127	1.8	364	5.0	7551	
by Race	n	%	n	%	n	%	n	%	n	%
White	13627	40.3	6534	19.7	548	1.7	1687	5.1	33778	59.3
Black	3382	41.6	2613	33.3	311	3.9	1007	12.6	8130	14.3
Hispanic	5180	50.5	2728	27.3	360	3.7	987	9.8	10252	18.0
Other	2303	47.7	1094	23.3	147	3.1	337	7.1	4829	8.5
by Grade	n	%	n	%	n	%	n	%	n	%
9th	7256	44.9	4611	29.3	490	3.1	1664	10.5	16167	28.1
10th	6564	44.1	3527	24.3	354	2.5	1058	7.2	14878	25.9
11th	5876	43.1	2745	20.6	283	2.1	751	5.6	13641	23.7
12th	5030	39.2	2179	17.3	233	1.9	556	4.4	12835	22.3
Total Females	24826	43.0	13139	23.3	1387	2.5	4070	7.2	57708	100.0

Note: Depressed mood and/or suicidal behaviors accounts for at least one positive response to having a depressed mood, considering, planning or attempting suicide in the past 12 months. Physical fighting is a positive response to at least one physical fight in the past 12 months. Weighted values are reported.

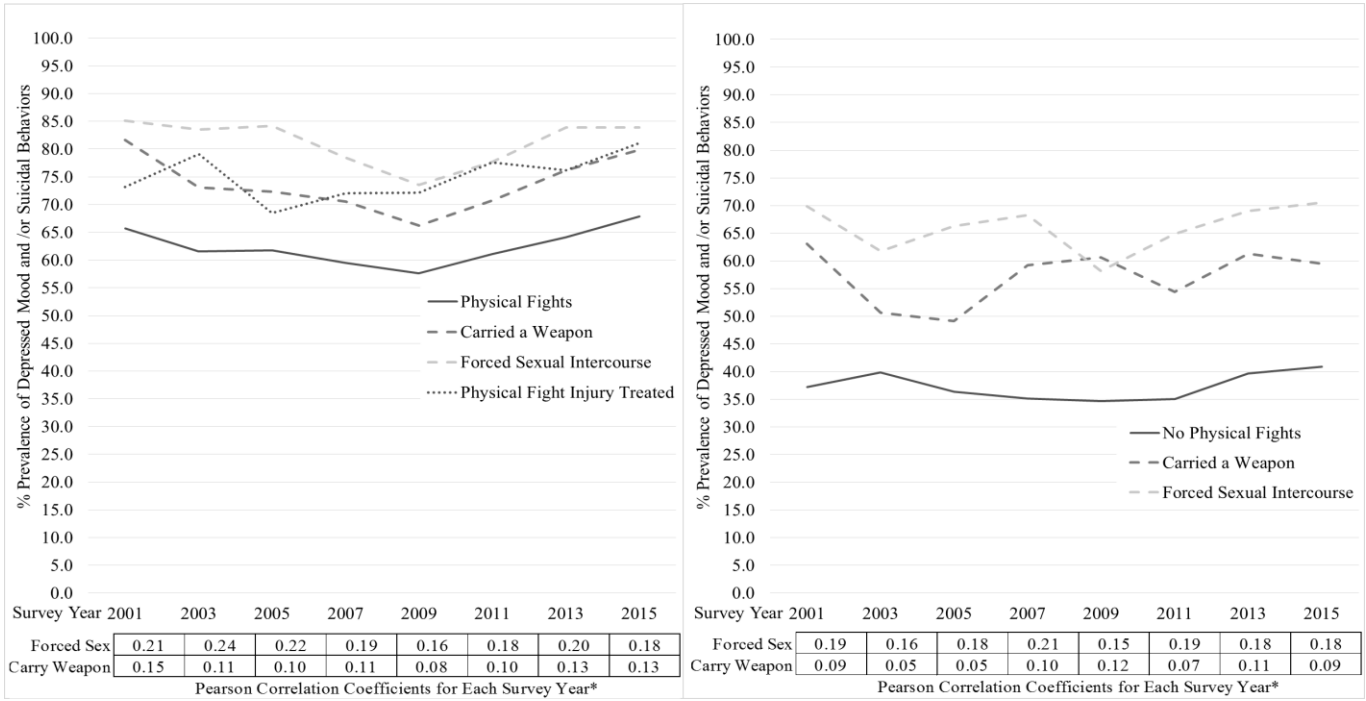


FIGURE 4.1 Trends Analysis 2: Depressed Mood and/or Suicidal Behaviors among Females Exposed Physical Fighting vs. Non-Physical Fighters (YRBS, 2001-2015)

Depressed Mood and/or Suicidal Behaviors: Significant quadratic trend, 2009 is statistically significantly different than the average for the other years, $p<0.001$; years post 2009 are also significantly different (2011: $p=0.007$, 2013: $p=0.024$, 2015: $p=0.007$). 2001-2009 is a significant linear decrease ($p<0.001$), 2009-2015 is a significant linear increase ($p<0.001$). Treated Injury from Physical Fight: Significant quadratic trend, 2009 is significantly different than the average of the other years ($p<0.001$), 2011 is also significantly different ($p=0.039$). 2001-2009 is a significant linear decrease ($p<0.001$), 2009-2015 is a significant linear increase ($p=0.001$). Other violent events were significantly correlated with the outcome ($p<0.001$), except being threatened or injured with a weapon among physical fighters in 2015 ($p=0.329$). Among physical fighters, only carried a weapon and forced sexual intercourse followed a similar pattern.

TABLE 4.2 Final Models**:** Odds Ratio of Depressed Mood and/or Suicidal Behaviors for Physical Fighting and Other Violent Behaviors (YRBS Females, 2001-2015)

Model 1: 2001-2015*	Depressed/ Suicidality	Depressed Mood	Consider Suicide	Plan Suicide	Attempt Suicide	Suicide Attempt Injury Treated
	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI
Physical fighting: 1x/12 months	2.02 [1.89, 2.17]	1.96 [1.83, 2.11]	2.00 [1.84, 2.16]	1.76 [1.60, 1.93]	2.34 [2.09, 2.63]	2.21 [1.76, 2.77]
Physical fighting: 2-3x/12 months	2.28 [2.07, 2.52]	2.14 [1.95, 2.34]	2.23 [2.02, 2.46]	1.97 [1.75, 2.23]	2.70 [2.39, 3.05]	2.78 [2.19, 3.52]
Physical fighting: 4+x/12 months	2.50 [2.15, 2.92]	2.25 [1.93, 2.62]	2.74 [2.36, 3.18]	3.00 [2.57, 3.50]	4.14 [3.47, 4.94]	4.28 [3.33, 5.48]
Carried a weapon (last 30 days)	1.75 [1.60, 1.92]	1.59 [1.43, 1.76]	1.77 [1.61, 1.95]	1.84 [1.66, 2.04]	2.04 [1.81, 2.30]	2.23 [1.85, 2.70]
School absence, unsafe (≥1/30 days)	2.46 [2.18, 2.78]	2.66 [2.37, 2.98]	1.68 [1.50, 1.90]	1.62 [1.43, 1.84]	2.03 [1.75, 2.34]	2.24 [1.77, 2.85]
Threatened/injured with weapon	2.02 [1.77, 2.30]	1.83 [1.63, 2.06]	1.75 [1.56, 1.97]	1.87 [1.65, 2.12]	1.90 [1.65, 2.18]	1.67 [1.34, 2.07]
Forced intercourse/ sex (lifetime)	3.20 [2.96, 3.50]	2.87 [2.66, 3.10]	2.96 [2.75, 3.19]	2.85 [2.61, 3.10]	3.38 [3.05, 3.75]	3.97 [3.34, 4.71]

Model controlled for grade, race and quadratic trend for survey year. Reference groups for physical fighting is non-fighters, reference group for other violent events is no exposures. *Variables in 2001-2015 models were statistically significant (p<0.010)

TABLE 4.2 *(Continued)* Final Models**:** Odds Ratio of Depressed Mood and/or Suicidal Behaviors of Physical Fighting and Other Violent Behaviors (YRBS Females, 2001-2015)

Model 2: 2011 - 2015**	Depressed/ Suicidality OR 95% CI	Depressed Mood OR 95% CI	Consider Suicide OR 95% CI	Plan Suicide OR 95% CI	Attempt Suicide OR 95% CI	Suicide Attempt Injury Treated OR 95% CI
Physical fighting: 1x/12 months	1.90 [1.68, 2.15]	1.78 [1.57, 2.01]	1.72 [1.49, 1.99]	1.54 [1.30, 1.83]	2.29 [1.90, 2.77]	2.17 [1.52, 3.11]
Physical fighting: 2-3x/12 months	2.21 [1.86, 2.62]	2.03 [1.69, 2.43]	2.05 [1.73, 2.44]	1.90 [1.56, 2.31]	2.82 [2.27 3.51]	2.60 [1.78, 3.80]
Physical fighting: 4+x/12 months	1.98 [1.47 2.68]	1.71 [1.25, 2.33]	2.01 [1.53, 2.66]	2.78 [2.12, 3.65]	3.37 [2.39, 4.74]	4.24 [2.75, 6.52]
Carried a weapon (last 30 days)	1.85 [1.57, 2.17]	1.58 [1.35, 1.85]	1.90 [1.60, 2.27]	1.85 [1.56, 2.20]	2.10 [1.75, 2.52]	1.67 [1.22, 2.28]
School absence, unsafe (≥1/30 days)	2.24 [1.87, 2.69]	2.42 [2.03, 2.88]	1.41 [1.17, 1.71]	1.41 [1.13, 1.76]	1.95 [1.60, 2.39]	2.16 [1.55, 3.00]
Threatened/Injured with Weapon	1.29 [1.03, 1.63]	1.18 [0.95, 1.48]	1.23 [0.98, 1.55]	1.29 [1.04, 1.60]	1.56 [1.23, 1.99]	1.53 [1.09, 2.15]
Forced intercourse/ sex (Lifetime)	2.78 [2.41, 3.20]	2.46 [2.14, 2.82]	2.70 [2.36, 3.08]	2.62 [2.27, 3.02]	3.10 [2.56, 3.77]	3.34 [2.50, 4.47]
Physically bullied at school	1.91 [1.72, 2.12]	1.73 [1.55, 1.92]	2.08 [1.83, 2.35]	2.00 [1.80, 2.23]	1.68 [1.43, 1.97]	1.43 [1.12, 1.84]
Electronically bullied	2.42 [2.17, 2.70]	2.38 [2.13, 2.67]	2.11 [1.87, 2.36]	1.85 [1.62, 2.12]	2.05 [1.72, 2.45]	2.40 [1.79, 3.21]

**Variables in 2011-2015 were statistically significant (p<0.050), except threatened/injured with a weapon for depressed mood (*p*=0.140) and consider suicide (*p*=0.075). Reference groups for physical fighting is non-fighters, reference group for other violent events is no exposures. YRBS began collecting data on being bullied at school beginning in 2009 and the electronic form in 2011.

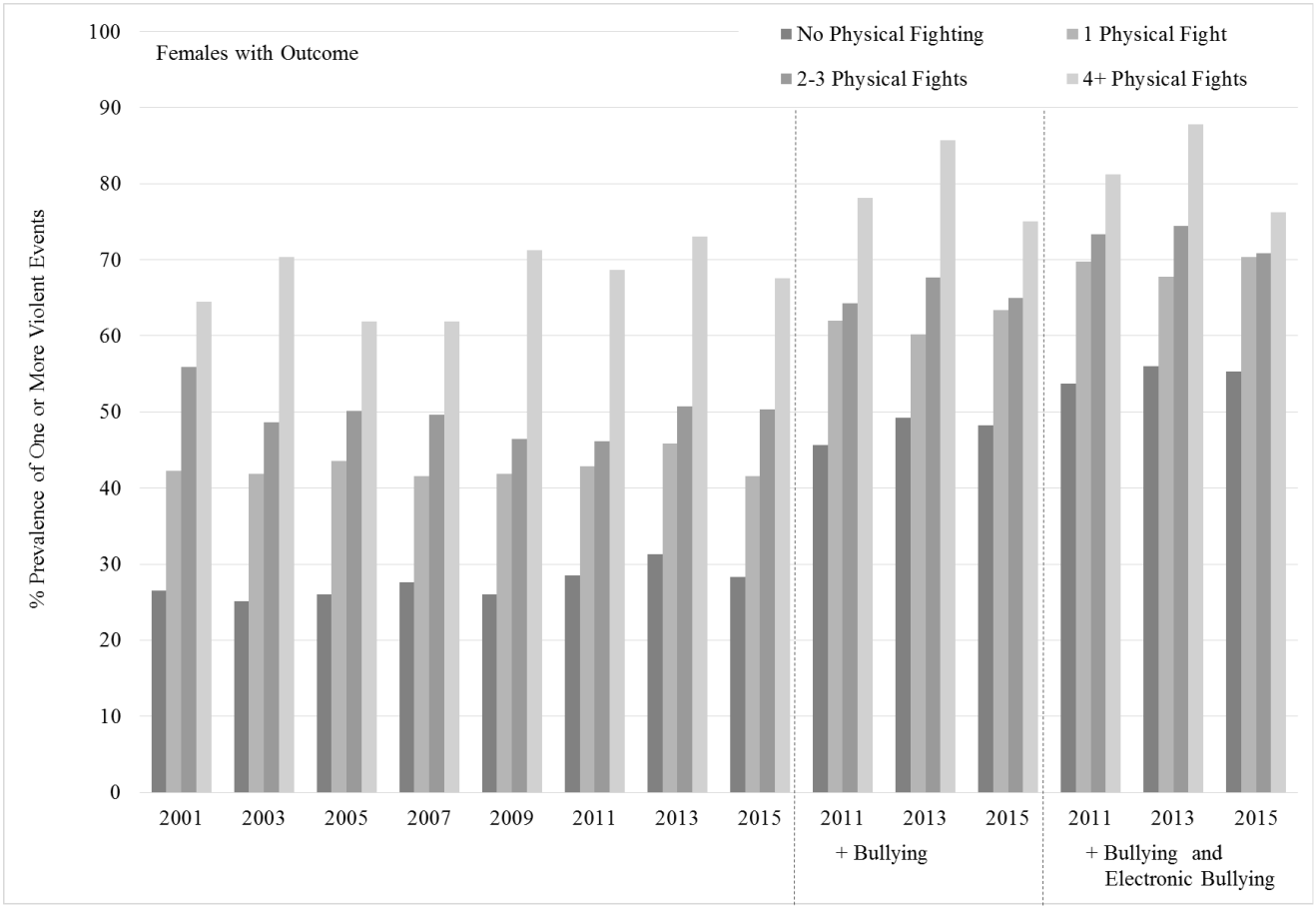


FIGURE 4.2 Prevalence of One or More Violent Events among Female with Depressed Mood and/or Suicidal Behaviors by Physical Fighting Status (YRBS, 2001-2015)

Violent risk behaviors are from Table 4.2 Final Model, at least one positive response to a violent risk behavior or exposure was required. * 2011-2015 data included exposures to bullying and electronic bullying.

TABLE 4.3 Percent of Physical Fighters with Depressed Mood and/or Suicidal Behaviors by Number of Other Violent Exposures (YRBS, 2011-2015)

Prevalence of Other Violent Events		2011	2013	2015
# of Other Violent Events:	0	50.0	47.0	51.1
	1	32.3	28.4	29.5
	2	11.9	15.9	12.7
	3+	5.8	8.7	6.7
including bullied	0	33.5	32.1	34.1
	1	36.2	31.1	30.4
	2	18.8	17.6	20.8
	3+	11.5	19.2	14.6
also including electronically bullied	0	26.4	25.9	28.5
	1	28.7	25.6	21.5
	2	22.7	19.1	23.4
	3+	22.2	29.4	26.6

Other violent events included: carrying a weapon, absence from school at least 1 day due to feeling unsafe, threatened/injured with a weapon, and forced sexual intercourse. YRBS began collecting data on being bullied in 2009 and the electronic form in 2011.

TABLE 4.4 Alternative Models**:** Odds Ratio of Depressed Mood and/or Suicidal Behaviors for Physical Fighting and Other Violent Events by Frequency (YRBS Females, 2001-2015)

Model 1: 2001-2015*	Depressed/ Suicidality	Depressed Mood	Consider Suicide	Plan Suicide	Attempt Suicide	Suicide Attempt Injury Treated
	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI
Physical fighting: 1x/12 months	1.99 [1.86, 2.14]	1.93 [1.80, 2.07]	1.95 [1.80, 2.11]	1.65 [1.48, 1.83]	2.27 [2.02, 2.54]	2.00 [1.61, 2.78]
Physical fighting: 2-3x/12 months	2.18 [1.98, 2.14]	2.05 [1.87, 2.25]	2.16 [1.95, 2.38]	1.82 [1.61, 2.07]	2.61 [2.30, 2.96]	2.54 [2.00, 3.23]
Physical fighting: 4+x/12 months	2.39 [2.06, 2.77]	2.13 [1.84, 2.45]	2.69 [2.34, 3.09]	2.83 [2.42, 3.30]	4.06 [3.44, 4.80]	3.99 [3.18, 5.01]
1 Violent event	2.69 [2.52, 2.88]	2.59 [2.42, 2.76]	2.42 [2.26, 2.61]	2.53 [2.34, 2.74]	2.97 [2.71, 3.27]	3.72 [3.13, 4.43]
2 Violent events	5.45 [4.77, 6.22]	4.71 [4.12, 5.37]	4.62 [4.12, 5.18]	4.56 [4.08, 5.11]	5.60 [4.94, 6.35]	7.43 [6.10, 9.05]
3 Violent events	7.30 [5.35, 9.95]	5.92 [4.55, 7.69]	5.84 [4.72, 7.22]	6.61 [5.38, 8.12]	9.82 [7.54, 12.77]	13.03 [9.89, 17.17]
4 Violent events	7.79 [3.64, 16.68]	6.20 [3.52, 10.93]	7.12 [4.44, 11.41]	8.03 [5.07, 12.70]	21.58 [13.06, 35.65]	32.34 [20.97, 49.87]

Reference groups are non-fighters and no violent event exposures. Model controlled for grade, race and quadratic trend for survey year. Other violent events included: carrying a weapon, absent ≥1 day from school due to feeling unsafe, threatened/injured with a weapon, and forced sexual intercourse. *Variables in 2001-2015 models were statistically significant (p<0.001).

TABLE 4.4 *(Continued)* Alternative Models**:** Odds Ratio of Depressed Mood and/or Suicidal Behaviors for Physical Fighting and Other Violent Events by Frequency (YRBS Females, 2001-2015)

Model 2: 2011 - 2015**	Depressed/ Suicidality	Depressed Mood	Consider Suicide	Plan Suicide	Attempt Suicide	Suicide Attempt Injury Treated
	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI
Physical fighting: 1x/12 months	2.03 [1.69, 2.42]	1.75 [1.47, 2.07]	1.82 [1.53, 2.16]	1.65 [1.35, 2.00]	2.43 [1.96, 3.03]	1.45 [1.06, 1.99]
Physical fighting: 2-3x/12 months	2.07 [1.60, 2.68]	1.96 [1.50, 2.55]	1.89 [1.47, 2.43]	1.80 [1.41, 2.31]	2.81 [2.06 3.82]	1.45 [1.03, 2.04]
Physical fighting: 4+x/12 months	1.38 [0.95, 2.02]	1.24 [0.82, 1.86]	1.71 [1.22, 2.39]	2.51 [1.75, 3.58]	3.26 [2.14, 4.98]	2.24 [1.56, 3.22]
1 Violent event	2.50 [2.22, 2.82]	2.30 [2.02, 2.62]	2.69 [2.40, 3.02]	2.35 [2.07, 2.67]	3.05 [2.48, 3.76]	2.97 [2.06, 4.28]
2 Violent events	4.56 [3.93, 5.29]	4.33 [3.76, 4.99]	4.75 [4.03, 5.60]	3.98 [3.28, 4.82]	4.91 [3.73, 6.45]	8.61 [6.34, 11.70]
3 Violent events	10.55 [8.02, 13.87]	7.93 [6.43, 9.78]	8.92 [6.77, 11.74]	7.54 [5.69, 9.98]	8.98 [6.63, 12.17]	15.72 [10.45, 23.64]
4 Violent events	11.76 [7.51, 18.41]	9.28 [6.10, 14.13]	11.91 [8.12, 17.48]	8.92 [6.13, 12.97]	16.24 [10.98, 24.03]	25.46 [17.22, 37.64]
5 Violent events	18.79 [5.04, 70.04]	14.00 [4.83, 40.62]	20.02 [8.38, 47.82]	22.77 [10.55, 49.11]	46.29 [23.65, 90.58]	64.52 [34.36, 121.13]
6 Violent events	12.00 [2.72, 53.04]	15.67 [3.48, 70.64]	17.70 [5.92, 52.91]	16.15 [6.05, 43.13]	28.49 [10.60, 76.59]	101.39 [42.75, 240.49]

**Variables in 2011-2015 were statistically significant (p<0.050), except physical fighting 4+ times for depressed/suicidality (*p*=0.092) and depressed mood only (*p*=0.311). YRBS began collecting data on being bullied in 2009, and the electronic form in 2011, which were included as potential violent events in this model.

CHAPTER 5

CONCLUSION TO MENTAL HEALTH TRENDS AMONG FEMALE YOUTH AND THE RELATIONSHIP WITH VIOLENCE

This research found that changes in the prevalence of depressed mood and/or suicidal behaviors followed a pattern similar to the changes in the percent who were victims of forced sexual intercourse and who were involved in physical fighting: a decline from 2001 through 2009 followed by an incline through 2015. Further investigation revealed that the direction of these changes may be attributable to unique modifiable risk factors. Results aligned with the conceptual framework in that the emergence of electronic bullying contributed to increased depressed mood and/or suicidal behaviors and poly-victimization. Also, electronic bullying induced greater risk than bullying and being a victim of violence induced greater risk than demonstrating violence-related behaviors. Otherwise, a distinct difference in the levels of risk for unique forms of violence did not exist between the violent events that were measured by the national YRBS. However, the accumulation of violent exposures was a stronger predictor of depressed mood and/or suicidal behaviors.

Notable findings for the unique risk behavior trends among females exposed to forced sexual intercourse, included a decline in methamphetamine use from 2001 through 2015 and an increase in team sports participation in 2009. For physical fighters, the trends were only evaluated for other violent behaviors. The data indicated that, both forced sexual intercourse and carrying a weapon followed a similar pattern. In both of these populations, electronic bullying and bullying contributed to the increasing prevalence in depressed mood and/or suicidal behaviors post-2009. Also, more frequent physical fighting was associated with a corresponding increase in risk, severity of the outcome, and higher prevalence of exposure to at least one other violent event. When accounting for electronic bullying and bullying, exposure to at least one other violent event was more common than having no other exposures.

As for the sensitivity analyses, suicide attempts that required medical treatment were associated with more violent exposures. Among physical fighters, the outcome was more common among those who sustained injuries that required treatment, and nearly one third of this subpopulation had also been treated for a suicide attempt injury in the past 12 months.

Trends analyses proximal to this time period that addressed changes in the prevalence of depressed mood and/or suicidal behaviors among female adolescent victims of forced sexual intercourse or aggressors engaged in physical fighting were not found in the literature. A previous YRBS trends analysis of suicidal behaviors for all students from 1991 through 2011 was reported, with results indicating a linear decrease in the percent who planned and attempted suicides, and a quadratic trend for the percent of those considering suicide (Lowry, 2014). The trend analysis from this research adds to the literature by covering a period of time when electronic bullying emerged, revealing the consequential risk of depressed mood and suicidal behaviors, particularly when contributing to an increase in the number of violent exposures. This was an important finding given the rise in suicidal deaths among females ages 15 to 19 years and the implications to this population's health as they mature into adulthood (Anderson, 2003; Goldman-Mellor, 2014; Goldston, 2015; Heron, 2016; Sachs-Ericsson, 2016).

Identifying that the cumulative number of exposures to violent events was a potentially stronger measure of risk than the specific types of exposure contributed to the body of evidence in the field of suicide and depression prevention (Miller, 2013; Zimmerman, 2016). This finding indicates that targeted efforts that address multiple forms of violence, the prevention of re-victimization, or more prevalent violent exposures should be developed and implemented (Dunn, 2012; Miller, 2013). Collectively, electronic bullying appears to be an important contributor to the increase in depressed mood and suicidal behaviors among female adolescents, due to:

inducing greater risk than being bullied, being a highly prevalent form of violence in this population, and resulting poly-victimization. Other literature supports that the unique attributes of electronic bullying are responsible for the increase in severity for this form of bullying exposure (Bannink, 2014; Hinduja, 2014). Given these findings, there is a need to promote protective factors and build resiliency among female adolescents, such as, social connectedness (e.g. team sports), access to mental health and substance abuse services, and help-seeking behaviors when exposed to an act of violence (Stone, 2017).

This research should increase the awareness of how violence-related trauma adversely effects female youth (Donisch, 2016). Victimization appeared to induce greater risk than violence-related behaviors; however, even with the limited number of measured exposures, the majority of physical fighters were also victims of violence. Therefore, both victims and aggressors of violence are in need of interventions. Also, adolescent females who sustained an injury that needed treatment by a health care professional, due to a suicide attempt or physical fighting, are an important population to target given a likely history of poly-victimization and a subsequent increase in risk.

The challenge of identifying at-risk students has been noted as a barrier. This research identified several characteristics or potential coping behaviors that could facilitate the identification of at-risk students, including: a drop in academic performance or other signs of difficulty concentrating/remembering or insomnia, extended use of video games and computers, substance use, risky sexual behaviors, and aggression (Borofsky, 2013; Donisch, 2016; Herrman, 2012; King, 2008; Lowry, 2014; Weierstall, 2013). Participation in team sports was identified as a behavior that reduced the risk of depressed mood and suicidal behaviors among the female high school population, including victims of forced sexual intercourse. Other research has also found

that the social and physical attributes of this extra-curricular activity protect adolescents and is in need of further consideration as an intervention (Hallal, 2015; Riese 2015).

Further research is needed in the following areas: developing effective online environments that could serve as avenues for interventions (Sampasa-Kanying, 2015), designing tailored interventions for adolescents whose native language is not English, removing barriers to participation in team sports, identification of environmental factors that contribute to feeling unsafe at school (or when travelling) and manners to increase safety, continuing research to better understand the effects of electronic bullying and prevention strategies, developing strategies to reduce re-victimization, and focusing research specific to younger age-groups (Lorenzo-Blanco, 2016). The dynamics of the social culture for high school students will continue to change over time; therefore, researchers need to regularly conduct trends analyses to understand how populations at risk of poor mental health are changing and how this aligns with policies and other public health measures. One avenue to facilitate future surveillance would be the expansion of the YRBS survey, additions specific to patterns of electronic bullying as related to perpetration versus victimization versus both would be valuable for informing interventions. Another option would be a national survey specifically tailored to address depression and suicidal behaviors, with a broader collection of risk factors; such as family history, violence within the home, and access to mental health services.

The strengths of this research included the following: 1) due to the use of the YRBS, this research is nationally representative with results that are generalizable to female high school students in the U.S.; 2) established methods were used to identify trends in the outcome, while also evaluating risk factors 3) survey design and collection practices were implemented by the CDC to reduce reporting bias and selection bias, including efforts to obtain data from students who were absent on the surveillance day; 4) multiple risk behaviors, possible confounders, and categorical

frequencies were available for inclusion in multivariate models; 5) a population of victims and aggressors of violence were evaluated and the inclusion of additional measures of violent exposures was possible for the dose-response analysis of the 2015 dataset; 6) there was adequate power to address the research questions; and 7) the data source was high quality, with logic checks, omission criteria for invalid surveys and no imputed responses. In addition, the specific qualities of survey techniques for improving the validity of responses to sensitive questions, included: respondents assurance of anonymity, avoiding skip patterns, and implementing other measures to ensure privacy; which align to CDC and best practices (Kann, 2016; Krumpal, 2013).

The limitations for this research included the following: 1) a lack of information on the sequence of events given the use of cross-sectional data and not being able to establish cause and effect; 2) the potential for systematic error due to changes in how high school students interpret and respond to the self-reported questionnaires; 3) underrepresentation of high risk populations, given the omission of adolescents who were not enrolled in school during this time period or who were absent on the surveillance day with unsuccessful follow-up efforts (Brener, 2013; DePaoli, 2015; Donisch, 2016); 4) the results cannot be extrapolated to smaller geographic areas; 5) exposure classification bias and underrepresentation of poly-victimization was possible, given some inconsistent wording of survey questions for select YRBS violent behaviors during the time period of interest, the lack of totality of possible violent exposures, and limited data on aggressive behaviors; 6) unmeasured confounders were present, given that data on mental health history, access to treatment, family risk factors, school settings or socioeconomic status were not collected; and 7) recall bias or errors were plausible given several of the self-reported questions asked about the prior 12 months.

Overall, the results of this research are of value to public health professionals and practitioners, due to the important epidemiologic evidence that depressed mood and/or suicidal behaviors

among female adolescents exposed to forced sexual intercourse or physical fighting has been increasing. These trends were most likely attributable to changes in modifiable risk factors and poly-victimization, emphasizing the need to monitor both outcomes and associated risk behaviors over time. Given the impact of electronic bullying, identifying and measuring newly emerging risks for depression and suicidal behaviors among adolescent females is essential for enabling prompt shifts in interventions and prevention measures.

The National Child Traumatic Stress Network (NCTSN) has recognized the phenomena depicted in the conceptual framework for this research and specifically addresses complex trauma in youth that can result in self-harm and assaulting others (NCTSN, 2016). This research elevates the need for health care providers to be aware of the adverse effects of violent victimization and aggression and the need to initiate evidence-based services for female adolescent victims, including those treated for acute injuries due to failed suicide attempts or physical fighting. The injured subpopulation is likely to utilize emergency department services; therefore, these healthcare settings should consider adopting trauma-informed practices (Bridge, 2014; Cunningham, 2014; NCTSN, 2016; Turecki, 2016). In addition to healthcare services, schools, and the juvenile justice systems have been identified as settings for providing trauma-informed services for adolescents (Borofsky, 2013; NCTSN, 2016). Each of these community environments should be observant of the characteristics of victimized adolescents, while also considering screening for violent exposures and associated symptoms (Duke, 2014; NCTSN, 2016; Sumner, 2015). When these at-risk youth are identified, then they can be provided resources and develop skills to prevent re-victimization, policies to ensure evidence-based mental health interventions for trauma can be developed and implemented, and protective factors can be promoted (Duke, 2014; NCTSN, 2016; Sumner, 2015). The risk for depressed mood and suicidality for female adolescents with multiple violent exposures, whether as victims or

aggressors, is disproportionately high and there is a need for continued research and evidence-based interventions in this vulnerable population.

APPENDIX

YRBS 2015 national survey questions on violence-related behaviors and symptoms of depression and suicidal behaviors. The YRBSS questionnaires are in the public domain and no permission is required for use or replication.

The next 11 questions ask about violence-related behaviors.

13. During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club?
    A. 0 days
    B. 1 day
    C. 2 or 3 days
    D. 4 or 5 days
    E. 6 or more days

14. During the past 30 days, on how many days did you carry a gun?
    A. 0 days
    B. 1 day
    C. 2 or 3 days
    D. 4 or 5 days
    E. 6 or more days

15. During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club on school property?
    A. 0 days
    B. 1 day
    C. 2 or 3 days
    D. 4 or 5 days
    E. 6 or more days

16. During the past 30 days, on how many days did you not go to school because you felt you would be unsafe at school or on your way to or from school?
    A. 0 days
    B. 1 day
    C. 2 or 3 days
    D. 4 or 5 days
    E. 6 or more days

17. During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?
    A. 0 times
    B. 1 time
    C. 2 or 3 times
    D. 4 or 5 times
    E. 6 or 7 times

F. 8 or 9 times
G. 10 or 11 times
H. 12 or more times

18. During the past 12 months, how many times were you in a physical fight?
    A. 0 times
    B. 1 time
    C. 2 or 3 times
    D. 4 or 5 times
    E. 6 or 7 times
    F. 8 or 9 times
    G. 10 or 11 times
    H. 12 or more times

19. During the past 12 months, how many times were you in a physical fight in which you were injured and had to be treated by a doctor or nurse?
    A. 0 times
    B. 1 time
    C. 2 or 3 times
    D. 4 or 5 times
    E. 6 or more times

20. During the past 12 months, how many times were you in a physical fight on school property?
    A. 0 times
    B. 1 time
    C. 2 or 3 times
    D. 4 or 5 times
    E. 6 or 7 times
    F. 8 or 9 times
    G. 10 or 11 times
    H. 12 or more times

21. Have you ever been physically forced to have sexual intercourse when you did not want to?
    A. Yes
    B. No

22. During the past 12 months, how many times did someone you were dating or going out with physically hurt you on purpose? (Count such things as being hit, slammed into something, or injured with an object or weapon.)
    A. I did not date or go out with anyone during the past 12 months
    B. 0 times
    C. 1 time
    D. 2 or 3 times
    E. 4 or 5 times
    F. 6 or more times

23. During the past 12 months, how many times did someone you were dating or going out with force you to do sexual things that you did not want to do? (Count such things as kissing, touching, or being physically forced to have sexual intercourse.)
    A. I did not date or go out with anyone during the past 12 months
    B. 0 times
    C. 1 time
    D. 2 or 3 times
    E. 4 or 5 times
    F. 6 or more times

The next 2 questions ask about bullying. Bullying is when 1 or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when 2 students of about the same strength or power argue or fight or tease each other in a friendly way.

24. During the past 12 months, have you ever been bullied on school property?
    A. Yes
    B. No

25. During the past 12 months, have you ever been electronically bullied? (Count being bullied through e-mail, chat rooms, instant messaging, websites, or texting.)
    A. Yes
    B. No

The next 5 questions ask about sad feelings and attempted suicide. Sometimes people feel so depressed about the future that they may consider attempting suicide, that is, taking some action to end their own life.

26. During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?
    A. Yes
    B. No

27. During the past 12 months, did you ever seriously consider attempting suicide?
    A. Yes
    B. No

28. During the past 12 months, did you make a plan about how you would attempt suicide?
    A. Yes
    B. No

29. During the past 12 months, how many times did you actually attempt suicide?
    A. 0 times
    B. 1 time
    C. 2 or 3 times
    D. 4 or 5 times
    E. 6 or more times

30. If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?
    A. I did not attempt suicide during the past 12 months
    B. Yes
    C. No

REFERENCES

Abrahams N., Jewkes, S Mathews S. (2013). Depressive symptoms after a sexual assault among women: understanding victim-perpetrator relationships and the role of social perceptions. *African Journal of Psychiatry; 16,* 288-293.

Agrawal, A., Constantino, A. M., Bucholz, K. K., Glowinski, A., Madden, P. A., Heath, A. C., & Lynskey, M. T. (2013). Characterizing alcohol use disorders and suicidal ideation in young women. *Journal of studies on alcohol and drugs, 74(3),* 406-412.

APA - American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Amstadter, A. B., Resnick, H. S., Nugent, N. R., Acierno, R., Rheingold, A. A., Minhinnett, R., & Kilpatrick, D. G. (2009). Longitudinal trajectories of cigarette smoking following rape. *Journal of traumatic stress, 22(2),* 113-121.

Amstadter, A. B., McCauley, J. L., Ruggiero, K. J., Resnick, H. S., & Kilpatrick, D. G. (2011). Self-Rated Health in Relation to Forced sexual intercourse and Mental Health Disorders in a National Sample of Women. *American journal of orthopsychiatry, 81(2),* 202-210.

Anderson R., Smith B. (2003*). Deaths: Leading Causes for 2001. National vital statistics reports: from the Centers for Disease Control and Prevention, Hyattsville, MD: National Center for Health Statistics, National Vital Statistics System, 52 (9), 18.* Retrieved from CDC website (April 3, 2017): https://www.cdc.gov/nchs/data/nvsr/nvsr52/nvsr52_09.pdf

Andrews, A. R., Jobe-Shields, L., López, C. M., Metzger, I. W., de Arellano, M. A., Saunders, B., & Kilpatrick, D. G. (2015). Poly-victimization, income, and ethnic differences in trauma-related mental health during adolescence. *Social psychiatry and psychiatric epidemiology, 50(8),* 1223-1234.

Arain, M., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A., ... & Sharma, S. (2013). Maturation of the adolescent brain. Neuropsychiatric disease and treatment, 9, 449.

Babiss, L. A., & Gangwisch, J. E. (2009). Sports participation as a protective factor against depression and suicidal ideation in adolescents as mediated by self-esteem and social support. *Journal of Developmental & Behavioral Pediatrics*, *30*(5), 376-384.

Bannink, R., Broeren, S., van de Looij–Jansen, P. M., de Waart, F. G., & Raat, H. (2014). Cyber and traditional bullying victimization as a risk factor for mental health problems and suicidal ideation in adolescents. *PloS (Public Library of Science) one,* 9(4), e94026.

Bell, T. M., Qiao, N., Jenkins, P. C., Siedlecki, C. B., & Fecher, A. M. (2016). Trends in Emergency Department Visits for Nonfatal Violence-Related Injuries Among Adolescents in the United States, 2009–2013. *Journal of Adolescent Health, 58(5),* 573-575.

Best, P., Manktelow, R., & Taylor, B. (2014). Online communication, social media and adolescent wellbeing: A systematic narrative review. *Children and Youth Services Review,* 41, 27-36.

Bohnert, K. M., Walton, M. A., Ranney, M., Bonar, E. E., Blow, F. C., Zimmerman, M. A., ... & Cunningham, R. M. (2015). Understanding the service needs of assault-injured, drug-using youth presenting for care in an urban Emergency Department. *Addictive behaviors, 41,* 97-105.

Boots, D., & Wareham, J. (2009). An exploration of DSM-oriented scales in the prediction of criminal offending among urban American youths. *Criminal Justice and Behavior, 36(8),* 840–860. doi:10.1177/0093854809337714.

Bor, W., Dean, A. J., Najman, J., & Hayatbakhsh, R. (2014). Are child and adolescent mental health problems increasing in the 21st century? A systematic review. *Australian & New Zealand Journal of Psychiatry, 48(7),* 606-616.

Borofsky, L. A., Kellerman, I., Baucom, B., Oliver, P. H., & Margolin, G. (2013). Community violence exposure and adolescents' school engagement and academic achievement over time. *Psychology of violence, 3*(4), 381-395.

Brabant, M. E., Hébert, M., & Chagnon, F. (2014). Predicting suicidal ideations in sexually abused female adolescents: a 12-month prospective study. *Journal of child sexual abuse, 23(4),* 387-397.

Breiding, M. J. (2014). Prevalence and characteristics of sexual violence, stalking, and intimate partner violence victimization—National Intimate Partner and Sexual Violence Survey, United States, 2011. *Morbidity and mortality weekly report. Surveillance summaries (Washington, DC: 2002), 63(8),* 1-4.

Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002). Reliability of the 1999 youth risk behavior survey questionnaire. *Journal of Adolescent Health, 31(4),* 336-342.

Brener, N. D., Kann, L., Shanklin, S., Kinchen, S., Eaton, D. K., Hawkins, J., & Flint, K. H. (2013). Methodology of the youth risk behavior surveillance system—2013. *MMWR Recomm Rep, 62*(1), 1-20. Retrieved from CDC website (April 3, 2017): https://www.cdc.gov/mmwr/pdf/rr/rr6201.pdf

Bridge, J. A., Horowitz, L. M., Fontanella, C. A., Grupp-Phelan, J., & Campo, J. V. (2014). Prioritizing research to reduce youth suicide and suicidal behavior. *American journal of preventive medicine*, *47*(3), S229-S234.

Center for Behavioral Health Statistics and Quality. (2015). *2014 National Survey on Drug Use and Health: Detailed Tables.* Retrieved from Substance Abuse and Mental Health Services Administration website (April 3, 2017): https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs2014/NSDUH-DetTabs2014.pdf

CDC - Center for Disease Control and Prevention (2016). *Violence Prevention, Youth Violence: Definitions.* Retrieved from CDC website (June 14, 2017): https://www.cdc.gov/violenceprevention/youthviolence/definitions.html

CDC - Center for Disease Control and Prevention (2016a). *Adolescent and School Health Youth Risk Behavior Surveillance System (YRBSS) Methods.* Retrieved from CDC website (April 3, 2017): https://www.cdc.gov/healthyyouth/data/yrbs/methods.htm

CDC - Center for Disease Control and Prevention (2016b). *Adolescent and School Health Youth Risk Behavior Surveillance System Questionnaire: YRBS Questionnaire Content 1991-2017.* Retrieved from CDC website (April 3, 2017): https://www.cdc.gov/healthyyouth/data/yrbs/questionnaires.htm

CDC - Center for Disease Control and Prevention (2016c). *Adolescent and School Health YRBS Data and Documentation: Conducting Trends Analysis of YRBS Data.* Retrieved from CDC website (April 3, 2017): https://www.cdc.gov/healthyyouth/data/yrbs/pdf/2015/2015_yrbs_conducting_trend_analyses.pdf

CDC- Centers for Disease Control and Prevention (CDC) (2016d). *Adolescent and School Health: Youth Risk Behavior Surveillance System (YRBSS) Questionnaires, National High School Survey.* Retrieved from CDC Website (February 26, 2017): ftp://ftp.cdc.gov/pub/data/yrbs/2015/2015_xxh_questionnaire.pdf

CDC - Center for Disease Control and Prevention (2017). *About Child and Teen BMI.* Retrieved from CDC website (April 3, 2017): https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html

Cisler, J. M., Begle, A. M., Amstadter, A. B., Resnick, H. S., Danielson, C. K., Saunders, B. E., & Kilpatrick, D. G. (2012). Exposure to interpersonal violence and risk for PTSD, depression, delinquency, and binge drinking among adolescents: Data from the NSA-R. *Journal of traumatic stress*, *25*(1), 33-40.

Chen, X. (2006). *Surveylogistic regression: Some SAS® and SUDAAN® comparisons. Proceedings of NESUG (North East SAS Users Group Conference)*. Retrieved from NESUG website (April 3, 2017): http://www.lexjansen.com/nesug/nesug06/po/po12.pdf

Cisler, J. M., Steele, J. S., Smitherman, S., Lenow, J. K., & Kilts, C. D. (2013). Neural processing correlates of assaultive violence exposure and PTSD symptoms during implicit threat processing: A network-level analysis among adolescent girls. *Psychiatry Research: Neuroimaging*, *214*(3), 238-246.

Cunningham, R. M., Ranney, M., Newton, M., Woodhull, W., Zimmerman, M., & Walton, M. A. (2014). Characteristics of youth seeking emergency care for assault injuries. *Pediatrics, 133(1),* e96-e105.

Currier, D., & Mann, J. J. (2008). Stress, genes and the biology of suicidal behavior. *Psychiatric Clinics of North America*, *31*(2), 247-269.

Curtin, S. C., Warner, M., & Hedegaard, H. (2016). Increase in suicide in the United States, 1999–2014. *NCHS data brief, 241,* 1-8.

Dahlberg LL, Krug EG. Violence: a global public health problem. In: Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, editors. World report on violence and health. Geneva (Switzerland): World Health Organization; 2002. p. 1-21.

Darnell, D., Peterson, R., Berliner, L., Stewart, T., Russo, J., Whiteside, L., & Zatzick, D. (2015). Factors associated with follow-up attendance among forced sexual intercourse victims seen in acute medical care. *Psychiatry, 78(1),* 89-101.

Deeds, B. G., Lagrange, R., & Simoni-Wastile, L. (2007). Understanding trends in youth violence: The role of gender, victimization, and depression. *Journal of Adolescent Health, 40,* S15–S16.

DePaoli, J. L., Fox, J. H., Ingram, E. S., Maushard, M., Bridgeland, J. M., & Balfanz, R. (2015). Building a Grad Nation: Progress and Challenge in Ending the High School Dropout Epidemic. Annual Update 2015. *Civic Enterprises.*

Donisch, K., Bray, C., & Gewirtz, A. (2016). Child welfare, juvenile justice, mental health, and education providers' conceptualizations of trauma-informed practice. *Child maltreatment, 21(2),* 125-134.

Duke, N. N., & Borowsky, I. W. (2014). Adolescent interpersonal violence: implications for health care professionals. *Primary Care: Clinics in Office Practice, 41(3),* 671-689.

Dunn, E. C., Gilman, S. E., Willett, J. B., Slopen, N. B., & Molnar, B. E. (2012). The impact of exposure to interpersonal violence on gender differences in adolescent-onset major depression: results from the national comorbidity survey replication (NCS-R). *Depression and anxiety, 29(5),* 392-399.

Finkelhor, D. Turner, H., Ormrod, R. Hamby, S. & Kracke, K. (2009). *Children's Exposure to Violence: A Comprehensive National Survey. U.S. Department of Justice: Office of Justice Programs and Delinquency Prevention.* Juvenile Justice Bulletin, 1-11.Retrieved from U.S. Department of Justice Website (February 26, 2017): https://www.ncjrs.gov/pdffiles1/ojjdp/227744.pdf

Finkelhor, D., Turner, H. A., Shattuck, A., & Hamby, S. L. (2015). Prevalence of childhood exposure to violence, crime, and abuse: Results from the National Survey of Children's Exposure to Violence. *Journal of American Medical Association (JAMA) pediatrics, 169*(8), 746-754.

Foster, D. W., Buckner, J. D., Schmidt, N. B., & Zvolensky, M. J. (2016). Multisubstance use among treatment-seeking smokers: synergistic effects of coping motives for cannabis and alcohol use and social anxiety/depressive symptoms. *Substance use & misuse, 51(2),* 165-178.

Giletta, M., Hastings, P. D., Rudolph, K. D., Bauer, D. J., Nock, M. K., & Prinstein, M. J. (2016). Suicide ideation among high-risk adolescent females: Examining the interplay between parasympathetic regulation and friendship support. *Development and psychopathology,* 1-15.

Gladden RM, Vivolo-Kantor AM, Hamburger ME, Lumpkin CD. (2013). *Bullying Surveillance Among Youths: Uniform Definitions for Public Health and Recommended Data Elements, Version 1.0.* Atlanta, GA; National Center for Injury Prevention and Control, Centers for Disease Control and Prevention and U.S. Department of Education. Retrieved from CDC website (April 3, 2017): http://www.cdc.gov/violenceprevention/pdf/bullying-definitions-final-a.pdf

Goldman-Mellor, S. J., Caspi, A., Harrington, H., Hogan, S., Nada-Raja, S., Poulton, R., & Moffitt, T. E. (2014). Suicide attempt in young people: a signal for long-term health care and social needs. *JAMA psychiatry, 71(2),* 119-127.

Goldston, D. B., Daniel, S. S., Erkanli, A., Heilbron, N., Doyle, O., Weller, B., ... & Faulkner, M. (2015). Suicide attempts in a longitudinal sample of adolescents followed through adulthood: Evidence of escalation. *Journal of consulting and clinical psychology, 83(2),* 253.

Gorka, S. M., Hedeker, D., Piasecki, T. M., & Mermelstein, R. (2017). Impact of alcohol use motives and internalizing symptoms on mood changes in response to drinking: An ecological momentary assessment investigation. *Drug and Alcohol Dependence, 173,* 31-38.

Gower, A. L., & Borowsky, I. W. (2013). Associations between frequency of bullying involvement and adjustment in adolescence. *Academic pediatrics, 13(3),* 214-221.

Grabbe, L., Ball, J., & Hall, J. M. (2016). Girlhood Betrayals of Women Childhood Trauma Survivors in Treatment for Addiction. *Journal of nursing scholarship, 48(3),* 232-43. doi: 10.1111/jnu.12202

Green, J. G., Johnson, R. M., Dunn, E. C., Lindsey, M., Xuan, Z., & Zaslavsky, A. M. (2014). Mental health service use among high school students exposed to interpersonal violence. *Journal of school health, 84(2),* 141-149.

Groff Stephens, S., & Wilke, D. J. (2016). Sexual violence, weight perception, and eating disorder indicators in college females. *Journal of American college health*, *64*(1), 38-47.

Hallal, P. C., Martinez-Mesa, J., Coll, C. V., Mielke, G. I., Mendes, M. A., Peixoto, M. B., ... & Menezes, A. (2015). Physical Activity at 11 Years of Age and Incidence of Mental Health Problems in Adolescence: Prospective Study. *Journal of physical activity & health, 12(4),* 535-539.

Hankin, B. L., Young, J. F., Abela, J. R., Smolen, A., Jenness, J. L., Gulley, L. D., ... & Oppenheimer, C. W. (2015). Depression from childhood into late adolescence: Influence of gender, development, genetic susceptibility, and peer stress. *Journal of abnormal psychology, 124(4),* 803.

Hawton, K., i Comabella, C. C., Haw, C., & Saunders, K. (2013). Risk factors for suicide in individuals with depression: a systematic review. *Journal of affective disorders, 147(1),* 17-28.

Heron, M. (2016). *Deaths: Leading Causes for 2014. National vital statistics reports: from the Centers for Disease Control and Prevention, Hyattsville, MD: National Center for Health Statistics, National Vital Statistics System, 65(5), p. 22.* Retrieved from CDC website (February 26, 2017): https://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_05.pdf

Herrman, J. W., & Silverstein, J. (2012). Girls and violence: a review of the literature. *Journal of community health nursing, 29(2),* 63-74.

Hinduja, S., & Patchin, J. W. (2014). *Cyberbullying.* Retrieved from Cyberbullying Research Center Website (February 26, 2017): http://www.cyberbullying.org/Cyberbullying-Identification-Prevention-Response.pdf

Hosmer DW, & Lemeshow S. (1999). *Applied Survival Analysis: Regression Modeling of Time to Event Data* (pp.132-153). New York: Wiley.

Hosmer, D. W., & Lemeshow, S. (2005). *Applied logistic regression* (pp. 31-46, 91-142). John Wiley & Sons, Inc.

Javdani, S., Abdul-Adil, J., Suarez, L., Nichols, S. R., & Farmer, A. D. (2014). Gender Differences in the Effects of Community Violence on Mental Health Outcomes in a Sample of Low-Income Youth Receiving Psychiatric Care. *American journal of community psychology, 53(3-4),* 235-248.

Kann, L. (2016). Youth Risk Behavior Surveillance—United States, 2015. *MMWR. Surveillance Summaries,* 65. Retrieved from CDC Website (February 26, 2017): https://www.cdc.gov/mmwr/volumes/65/ss/ss6506a1.htm

Kindrick, C., Gathright, M., Cisler, J. M., & Messias, E. (2013). Sadness, suicide, and sexual behavior in Arkansas: results from the youth risk behavior survey 2011. *The Journal of the Arkansas Medical Society, 110(7),* 134-136.

King, K. M., & Chassin, L. (2008). Adolescent stressors, psychopathology, and young adult substance dependence: A prospective study. *Journal of Studies on Alcohol and Drugs, 69*(5), 629.

Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: a literature review. *Quality & Quantity, 47(4),* 2025-2047.

Lenhart, A. (2012). *Teens, smartphones & texting.* Retrieved from Pew Internet and American Life Project website (February 26, 2017): http://www.pewinternet.org/2012/03/19/teens-smartphones-texting/

Lenhart A. (2015) *Teens, social media & technology overview 2015.* Retrieved from Pew Internet and American Life Project website (April 3, 2017): www.pewinternet.org/2015/04/09/teens-social-media-technology-2015/

Lereya, S. T., Copeland, W. E., Zammit, S., & Wolke, D. (2015). Bully/victims: a longitudinal, population-based cohort study of their mental health. *European child & adolescent psychiatry*, *24*(12), 1461-1471.

Lorenzo-Blanco, E. I., Unger, J. B., Oshri, A., Baezconde-Garbanati, L., & Soto, D. (2016). Profiles of bullying victimization, discrimination, social support, and school safety: Links with Latino/a youth acculturation, gender, depressive symptoms, and cigarette use. *American journal of orthopsychiatry, 86(1),* 37.

Lowry, R., Crosby, A. E., Brener, N. D., & Kann, L. (2014). Suicidal thoughts and attempts among US high school students: Trends and associated health-risk behaviors, 1991–2011. *Journal of Adolescent Health, 54(1),* 100-108.

Madden, M., Lenhart, A., Duggan, M., Cortesi, S., & Gasser, U. (2013). *Teens and technology 2013.* Retrieved from Pew Internet and American Life Project website (February 26, 2017): http://www.pewinternet.org/2013/03/13/teens-and-technology-2013/

McLoughlin, A. B., Gould, M. S., & Malone, K. M. (2015). Global trends in teenage suicide: 2003-2014. *Quarterly Journal of Medicine (QJM),* hcv026.

Miller, A. B., Esposito-Smythers, C., Weismoore, J. T., & Renshaw, K. D. (2013). The relation between child maltreatment and adolescent suicidal behavior: a systematic review and critical examination of the literature. *Clinical child and family psychology review, 16*(2), 146-172.

Mitchell, K. J., Finkelhor, D., Wolak, J., Ybarra, M. L., & Turner, H. (2011). Youth internet victimization in a broader victimization context. *Journal of Adolescent Health, 48(2),* 128-134.

National Child Traumatic Stress Network (NCTSN). (2016). *Creating trauma informed systems.* Retrieved from NCTSN Website (May 19, 2017): http://www.nctsn.org/

National Institute of Health (NIH) (2011). *National Institutes of Health Violence Against Women Research Report, Fiscal Year 2011.* Retrieved from NIH Website (February 26, 2017): https://orwh.od.nih.gov/resources/pdf/VAW-NIH-Report-2011.pdf

Olfson, M., Druss, B. G., & Marcus, S. C. (2015). Trends in mental health care among children and adolescents. *New England Journal of Medicine, 372(21),* 2029-2038.

Palmisano, G. L., Innamorati, M., & Vanderlinden, J. (2016). Life adverse experiences in relation with obesity and binge eating disorder: A systematic review. *Journal of Behavioral Addictions, 5*(1), 11-31.

Patel, A., Roston, A., Tilmon, S., Stern, L., Roston, A., Patel, D., & Keith, L. (2013). Assessing the extent of provision of comprehensive medical care management for female sexual assault patients in US hospital emergency departments. *International Journal of Gynecology & Obstetrics, 123(1),* 24-28.

Ranney, M. L., Locci, N., Adams, E. J., Betz, M., Burmeister, D. B., Corbin, T., ... & North, C. (2014). Gender-specific Research on Mental Illness in the Emergency Department: Current Knowledge and Future Directions. *Academic Emergency Medicine, 21(12),* 1395-1402.

Rickwood, D. J., Mazzer, K. R., & Telford, N. R. (2015). Social influences on seeking help from mental health services, in-person and online, during adolescence and young adulthood. *BMC psychiatry, 15(1),* 1.

Riese, A., Gjelsvik, A., & Ranney, M. L. (2015). Extracurricular activities and bullying perpetration: results from a nationally representative sample. *Journal of school health, 85(8),* 544-551.

Ruback, R. B., Clark, V. A., & Warner, C. (2014). Why Are crime victims at risk of being victimized again? Substance use, depression, and offending as mediators of the victimization–revictimization link. *Journal of interpersonal violence, 29(1),* 157-185.

Tomasula, J. L., Anderson, L. M., Littleton, H. L., & Riley-Tillman, T. C. (2012). The association between sexual assault and suicidal activity in a national sample. *School psychology quarterly, 27(2),* 109.

Torio, C. M., Encinosa, W., Berdahl, T., McCormick, M. C., & Simpson, L. A. (2015). Annual report on health care for children and youth in the United States: national estimates of cost, utilization and expenditures for children with mental health conditions. *Academic pediatrics, 15(1),* 19-35.

Sachs-Ericsson, N. J., Rushing, N. C., Stanley, I. H., & Sheffler, J. (2016). In my end is my beginning: developmental trajectories of adverse childhood experiences to late-life suicide. *Aging & mental health, 20(2),* 139-165.

Sampasa-Kanyinga, H., & Lewis, R. F. (2015). Frequent use of social networking sites is associated with poor psychological functioning among children and adolescents. *Cyberpsychology, Behavior, and Social Networking, 18(7),* 380-385.

Satyanarayana, V. A., Chandra, P. S., & Vaddiparti, K. (2015). Mental health consequences of violence against women and girls. *Current opinion in psychiatry, 28(5),* 350-356.

Stark, P., & Noel, A. M. (2015). *Trends in High School Dropout and Completion Rates in the United States: 1972-2012. Compendium Report. National Center for Education Statistics (NCES).* NCES 2015-015. Retrieved from NCES Website (February 26, 2017): https://nces.ed.gov/pubs2015/2015015.pdf

Stone, D. M., Holland, K. M., Bartholow, B. N., Crosby, A. E., Davis, S. P., & Wilkins, N. (2017). *Preventing suicide: a technical package of policies, programs, and practice.* Retrieved from CDC Website (February 26, 2017): https://stacks.cdc.gov/view/cdc/44275

Sumner, S. A., Mercy, J. A., Dahlberg, L. L., Hillis, S. D., Klevens, J., & Houry, D. (2015). Violence in the United States: status, challenges, and opportunities. *Journal of American Medical Association (JAMA), 314(5),* 478-488.

Swahn, M. H., Bossarte, R. M., Palmier, J. B., Yao, H., & Van Dulmen, M. H. (2013). Psychosocial characteristics associated with frequent physical fighting: findings from the 2009 National Youth Risk Behavior Survey. *Injury prevention, 19(2),* 143-146.

Tomasula, J. L., Anderson, L. M., Littleton, H. L., & Riley-Tillman, T. C. (2012). The association between sexual assault and suicidal activity in a national sample. *School psychology quarterly, 27(2),* 109.

Turecki, G., & Brent, D. A. (2016). Suicide and suicidal behaviour. *The Lancet, 387(10024),* 1227-1239.

Ulloa, E. C., & Hammett, J. F. (2016). The Effect of Gender and Perpetrator–Victim Role on Mental Health Outcomes and Risk Behaviors Associated With Intimate Partner Violence. *Journal of interpersonal violence, 31(7),* 1184-1207.

van der Put, C. E., Lanctôt, N., De Ruiter, C., & Van Vugt, E. (2015). Child maltreatment among boy and girl probationers: Does type of maltreatment make a difference in offending behavior and psychosocial problems?. *Child abuse & neglect, 46,* 142-151.

Waldron, J. C., Wilson, L. C., Patriquin, M. A., & Scarpa, A. (2014). Sexual Victimization History, Depression, and Task Physiology as Predictors of Sexual Revictimization Results From a 6-Month Prospective Pilot Study. *Journal of interpersonal violence, 30(4), 622-39.* doi: 10.1177/0886260514535258

Waldrop, A. E., Hanson, R. F., Resnick, H. S., Kilpatrick, D. G., Naugle, A. E., & Saunders, B. E. (2007). Risk factors for suicidal behavior among a national sample of adolescents: Implications for prevention. *Journal of traumatic stress, 20(5),* 869-879.

Weierstall, R., Hinsberger, M., Kaminer, D., Holtzhausen, L., Madikane, S., & Elbert, T. (2013). Appetitive aggression and adaptation to a violent environment among youth offenders. *Peace and Conflict: Journal of Peace Psychology, 19(2),* 138.

Wilkins, N., Tsao, B., Hertz, M., Davis, R., Klevens, J. (2014*). Connecting the Dots: An Overview of the Links Among Multiple Forms of Violence.* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention Oakland, CA: Prevention Institute. Retrieved from CDC Website (May 19, 2017): https://www.cdc.gov/violenceprevention/pdf/connecting_the_dots-a.pdf

Wong, M. M., Brower, K. J., & Zucker, R. A. (2011). Sleep problems, suicidal ideation, and self-harm behaviors in adolescence. *Journal of psychiatric research, 45(4),* 505-511.

Wong, S. S., Zhou, B., Goebert, D., & Hishinuma, E. S. (2013). The risk of adolescent suicide across patterns of drug use: a nationally representative study of high school students in the United States from 1999 to 2009. *Social psychiatry and psychiatric epidemiology, 48(10),* 1611-1620.

Ybarra, M. L., Mitchell, K. J., & Korchmaros, J. D. (2011). National trends in exposure to and experiences of violence on the Internet among children. *Pediatrics, 128(6),* e1376-e1386.

Zimmerman, G. M., & Posick, C. (2016). Risk factors for and behavioral consequences of direct versus indirect exposure to violence. *American journal of public health, 106(1),* 178-188.

Zosel, A., Bartelson, B. B., Bailey, E., Lowenstein, S., & Dart, R. (2013). Characterization of adolescent prescription drug abuse and misuse using the Researched Abuse Diversion and Addiction-related Surveillance (RADARS®) System. *Journal of the American Academy of Child & Adolescent Psychiatry, 52(2),* 196-204.

CURRICULUM VITAE

Janet Helene. Ford

Education

Ph.D., Indiana University; Indianapolis, IN (2017)

- Primary area: Epidemiology. Secondary area: Social and Behavioral Health
- Dissertation Research: "Mental Health Trends Among Female Youth and the Relationship with Violence"

MPH, Epidemiology, University of Minnesota; Minneapolis, MN (2000)

- Thesis title: Evaluation of an educational-based tobacco diversion program

BS, General Health Sciences, Purdue University, West Lafayette IN (1995)

Professional Career and Research Experience

Eli Lilly and Company, Indianapolis, IN

Global Health Outcomes Research Scientist – Biomedicines (January 2015 to present)

Primary scientist for headache compound, responsible for research deliverables, coaching, leadership and strategy

- Scientific lead for independent research from design through dissemination for observational research studies
- Present posters at scientific congresses, and collaborate with research experts in the field
- Manage vendor relationships for a variety of health outcomes deliverables, including: cross-sectional surveys, epidemiological reports, patient reported outcomes and observational research documents

- Lead team meetings for global health outcomes research plans, protocol development, and disclosures
- Partner with medical team on Phase 3 clinical trials, clinical planning, and regulatory documents; writing sections specific to outcome measures, patient populations, and the burden of illness
- Collaborate with marketing team as related to use of real world evidence (RWE) for understanding the current standard of care and unmet patient needs, and present data
- Coach new team members, provide scientific direction and review research deliverables, including economic model development, network meta-analyses, protocols and disclosures
- Develop global research plan to enable successful healthcare policy decisions at the time of launch

Global Patient Outcomes and RWE Consultant Scientist – Center of Expertise (March 2012 to December 2014)

Scientific lead for the use of internal real world data (RWD) for research supporting Biomedicine (2014)

- Led a team with RWE expertise, as related to: study designs, defining requirements, and interpretation of results
- Defined processes for ensuring business needs for RWE were met, including priority external requests on patient populations, prescription dosage patterns, and costs associated with health care resource utilization
- Educated other areas of the business in regard to RWE, including design elements, terminology and medical coding algorithms; increased the use and value of data-driven decisions across the business

- Provided, built and enhanced central expertise to ensure scientific rigor of research conducted with RWD; via internal capabilities and by leveraging external University relationships

Operational leader of a cross-functional team for a complex business-critical data system (2012-2013)

- Led team to achieve goals related to: system performance, compliance with procedures and contracts, privacy requirements, acquisition, transfers, data refreshes, system releases, and data access and use
- Developed scientific resources and training, on methods for designing and executing research using RWD
- Managed financial and business planning for data investments, and ensured timely decision-making
- Planned and implemented operations for growth into new business areas, regions and partnerships

Project Management Consultant (Critical Chain) – Clinical Development (May 2009 to February 2012)

- Developed expertise in methodology, created modules and led integration efforts for clinical research
- Partnered with leadership, global affiliates, third party organizations and staff
- Trained and provided coaching on clinical planning, best practices, and project execution

Pharmaceutical Project Management Team Leader - Early Phase (June 2007 to April 2009)

Supervisory responsibilities for Pharmaceutical Project Management Associates and Consultants

- Led staffing initiatives to increase the capabilities and impact of project management on drug development
- Managed staff workload, recruitment, retention and succession planning
- Led a Six Sigma Green Belt Project; including survey development, data collection and analysis of root causes
- Designed and instituted improvement initiatives for on-boarding and training
- Served as the project manager for cross-functional program-phase drug development teams

Clinical Project Management Consultant – Program Phase (June 2006 to May 2007)

Leader of cross-functional clinical teams for various compounds in the musculoskeletal therapeutic area

- Successfully led teams through various scenarios, timeline optimization and decision making
- Managed resources for multiple clinical trials; initiated and prioritized work on projects as planned
- Managed the clinical change control process and quarterly business planning activities
- Conducted risk assessment, and achieved milestones by implementing preventative and contingency plans

Neuroscience Senior Clinical Project Management Associate – U.S. Affiliate (June 2004 to May 2006)

Led project management activities (scope management, risk analysis, timeline and budget planning)

- Forecasted compound budgets and timelines; evaluated metrics, analyzed and monitored trends for adjustments

- Realized cycle time reductions, increases in milestones, budgets within 5% of plan, and annual financial savings
- Served as a Six Sigma Team member, supporting: survey development, data analysis, solutions and training

Neuroscience Clinical Project Development/Therapeutic Associate (March 2000 to May 2004)
Clinical trial project manager for Phase III and IV clinical trials; and scientific expert with knowledge of disease states (i.e. depression and fibromyalgia), compound and protocols

- Led cross-functional study teams, study development and issues management; managed vendor relationships
- Conducted literature searches, collaborated with consultants on research designs and study population criteria
- Designed and conducted training for multiple clinical trials and investigative sites
- Ensured data integrity by monitoring and tracking issues, analyzing protocol violations and addressing trends
- Interpreted data and wrote patient narratives, final study reports, and regulatory documents

Kelly Scientific (Eli Lilly and Company), Indianapolis, IN
Clinical Research Associate (December 1999 to March 2000)

- Site and study management (Endocrine)

Osteoporosis Research Clinic, Minneapolis, MN
Community Health Assistant (May 1999 to September 1999)

- Assisted in site activities related to managing pharmaceutical clinical trials and observational studies

University of Minnesota, Minneapolis, MN (October 1997 to January 1998)

Field Interviewer and Lab Technician, Epidemiology Department

- Responsible for field and lab activities for an observational study (the Minnesota Heart Survey)

Centeon Bio-Services INC., West Lafayette, IN

Group Leader: Autopheresis Technician I and II, and Donor Room Trainer (November 1995 to September 1997)

- Supervised and evaluated employee performance, resolved conflicts and instigated effective area operations

Publications, Abstracts, and Poster Presentations

Published Manuscripts

- Choong, C. K., Ford, J. H., Nyhuis, A. W., Joshi, S. G., Robinson, R. L., Aurora, S. K., & Martinez, J. M. (2017). Clinical Characteristics and Treatment Patterns Among Patients Diagnosed With Cluster Headache in US Healthcare Claims Data. Headache: The Journal of Head and Face Pain.
- O'Brien M, Ford J, Aurora S, Tepper S, Tepper D, Govindan S. Economics of Oxygen use in Cluster Headache. Headache. (Accepted, November Issue)
- Lazovich, D, Ford, J, Forster, J, Riley, B. (2001). A pilot study to evaluate a tobacco diversion program. American Journal of Public Health, 91(11), 1790-1791.

Manuscripts Submitted

- Ford J, Zollinger T, Nelson D, O'Neil J, Zhang J, Steele G. Differential effects on depressed mood and suicidal behaviors among female adolescents exposed to specific forms of violence, from electronic bullying to sexual dating violence. Psychology of Violence Journal.
- Ford J, Zollinger T, Nelson D, O'Neil J, Zhang J, Steele G. Depressed mood and suicidal behaviors among high school-aged female victims of forced sexual intercourse in their lifetime: A Trends Analysis of the Youth Risk Behavior Surveillance Survey from 2001 through 2015. Journal of Violence Against Women.
- Ford J, Zollinger T, Nelson D, O'Neil J, Zhang J, Steele G. Trends in depressed mood and suicidal behaviors among high school-aged females who engaged in physical fighting. Journal of Adolescent Health.
- Ford J, Martinez J, Kim G, Chu B, Fowler R, Nero D, Aurora S. Ahl J. Societal Burden of Cluster Headache in the US: A Retrospective Claims-Based Analysis. Headache.
- Ford J, Ahl J, Jackson J, Cotton S, Milligan G, Aurora S. Attainment of Treatment Goals in Episodic and Chronic Migraine, Preventive versus Acute Only Medication Use. Headache.

Manuscripts in Progress

- Ford J, Aurora S, Martinez J, Choong C, Nyhuis A, Robinson R. Treatment Costs for Cluster Headache Patients in a US Claims Database (Truven). Journal of Managed Care & Specialty Pharmacy.
- Ford J, Ayers D, Carter J, Nyhuis A, Aurora S, Skljarevski V. Measures of functioning using MSQ v2.1 in patients with a history of episodic migraine and treated with galcanezumab or placebo injections in a Phase 2 clinical trial.
- Ford J, Ahl J, Jackson J, Nyuis A, Cotton S. Burden of Illness Study: Migraine Patients with Cluster Headache.

Abstracts (published)/Poster Presentations

- Choong, C. K., Ford, J. H., Nyhuis, A. W., Robinson, R. L., Aurora, S., & Martinez, J. M. (2017, April). Clinical Characteristics and Treatment Patterns among Patients with Diagnostic Codes for Cluster Headache in US Healthcare Claims Data (P1. 181). Neurology, 88(16 Supplement), P1-181.
- Ford, J., Ayer, D., Nyhuis, A., Aurora, S., & Carter, J. (2017, April). Measures of functioning using MSQ v2. 1 in patients with a history of episodic migraine and treated with galcanezumab or placebo injections in a Phase 2 clinical trial (P2. 179). Neurology, 88(16 Supplement), P2-179.

  Encore: AHS (2017, June) American Headache Society - 59th Annual Scientific Meeting

  Planned Encore: DHCREF (2017) Headache Update 2017.
- Ford J, Jackson J, Milligan G, Cotton S, Ahl, J. (2016, June). A real-world analysis of outcomes in migraneurs receiving preventive migraine treatment. Headache, 56, 66-66.
- Ford, J. H., Jackson, J., Nyhuis, A., Cotton, S., & Ahn, J. (2016, June). Migraine patients with cluster headache: Exploratory study of the burden of illness. Headache, 56, 83-83.

Abstracts/Poster Presentations

- Ford J, Nyhuis A, Aurora S. Tx patterns and costs for episodic & chronic migraine (Truven). AAN (2017) American Academy of Neurology 2017 - 69th Annual Meeting. (Accepted)
- Choong C, Ford J, Nyhuis A, Robinson R, Martinez J. Demographics, Treatment Patterns, and Healthcare Utilization Among Patients with Diagnostic Claims for Cluster Headache in U.S. Healthcare Claims Data. DHCREF (2016) Headache Update 2016.
- Aurora S, Myers Oakes T, Ayer D, Nyhuis A, Zhang Q, Carter J, Martinez J, Ford J. Predictor of Significant Reduction in Migraine Headache Days and Correlation with

Improvement in Quality of Life with Galcanezumab. APS (2016) American Pain Society 2016, 35th Annual Scientific Meeting.

- Ford J, Jackson J, Milligan G, Cotton S, Lombard L, Ahl J (2016, September). Treatment Patterns in Migraine: A Real-World Analysis in a U.S. Population. EHMTIC (2016) European Headache and Migraine Trust International Congress 2016.
- Accepted Encore: DHCREF (2017) Diamond Headache Research and Educational Foundation 31st Congress.

Teaching Experience and Training, Professional Development and Affiliations

Teaching Experience and Training

- Fundamentals of Injury Epidemiology, Guest Lecturer July 18th and 25th (2017)
- IN Public Health Pre-Conference Academy: Proposal Writing and Grant Management (2016)
- Educational Training for Teaching Associates (Indiana University) (2014)
- Critical Chain Project Management Trainer (2009-2012)
- USMD Orientation: Drug Development Trainer (2004, 2005)

Professional Development

- Certified Project Management Professional (2008-2015)
- Critical Chain Project Management Expert (2009)
- Project Management (PM) Certification (IUPUI), PM BootCamp (PMLG Inc.) (2003, 2007)
- Six Sigma Green-Belt (2007)

Professional Affiliations

- American Association for the Advancement of Science (2016-present)
- International Society for Pharmacoeconomics and Outcomes Research (ISPOR) (2012-present)
- American Public Health Association (2008-2016)
- Project Management Institute (2008-2015)
- Drug Information Association (DIA) (2004)

Scientific Conferences, Awards and Committees

Scientific Conferences

- Indiana Suicide Prevention Conference, Presenter on Current Topics in Research (2017)
- IN Public Health Conference (2016)
- American Headache Society Annual Scientific Meeting (2016)
- International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Annual Meeting (2015)
- Drug Information Association Annual Meeting (2004)
- American Psychiatric Association Annual Meeting, International Myopain Conference (2000, 2001)

Awards and Committees

- Indiana Public Health Association Youth Violence Task Force (2016)
- Recipient of Recognition Grant or Bonus (2006, 2014, 2015, 2017)
- Lead-Candidate Development Operations Secretary (2008-2009)
- Leadership Behavior Award (2002 and 2005)

- Clinical Operations Share Fair Participant and Committee Member (2001, 2002, 2004)

Other Activities

Alumni Mentor: University of Minnesota School of Public Health Mentor Program

- Mentor first year MPH student on career and professional development (2016-present)

Community Volunteer: Local Schools and Connection Pointe, Brownsburg, IN *(Support Intermittently)*

- Mentor first year undergraduate student at Taylor University (2016)
- Work on efforts to provide social, food and clothing support for local communities and third world countries
- Provide assistance for classroom celebrations and various volunteer positions for extra curricula events

Student Volunteer: Public Health Core IUPUI, Indianapolis, IN (September 2010-August 2012)

- Provided support for Marion County and IN State Department of Health, including: flu vaccination clinics, data collection for school asthma prevention project, and others as needed